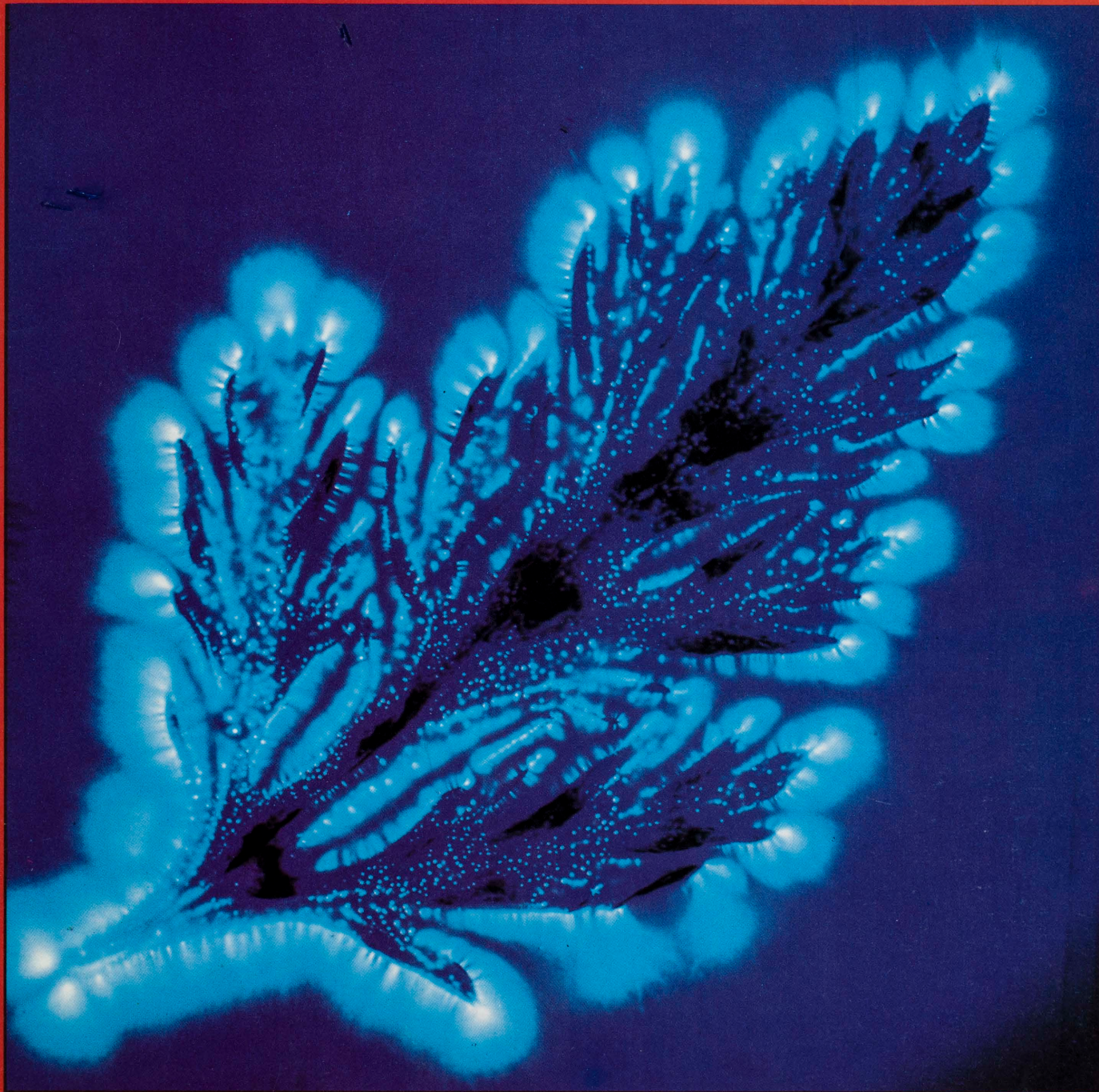


THE MEMBERS MAGAZINE OF THE NATURAL
HISTORY MUSEUM OF LOS ANGELES COUNTY
VOL. 13/NO. 2 FALL 1974

Terra



CHRYSANTHEMUM FRUTESCENS LEAF: KIRLIAN PHOTOGRAPHY

Stuffin' Nonsense

Stuffing a turkey is not too controversial (chestnuts or mushrooms or oysters?), but stuffing an elephant can raise quite a ruckus. Los Angeles *Times* columnist Jack Smith wrote recently about attending a banquet of the Lepidopterist Society at the Natural History Museum of Los Angeles County, "in the Hall of African Mammals among those remarkably lifelike dioramas of stuffed animals in their native habitats."

Jeanne Duque, member of the Docent Council and the Museum Alliance Board, rose to the challenge.

"Stuffed animals, indeed!" Mrs. Duque wrote Mr. Smith, "Can you imagine how much stuff it would take to stuff an elephant? And once you had him stuffed, how much would he weigh? What kind of stuff? . . . how would you start? . . . would you start with the stuffing and build a thing around it so you could make it fit inside the skin? . . . should you start with the feet so it would be right-side-up when you got done? Or would it be better to spread the skin on the floor of the den and fasten it up around the stuffing and figure out later how to get him on his feet? . . . how would you get the wrinkles in? . . ."

Mr. Smith responded in his column by dealing with Jeanne's questions one by one ("I would start from the front and work back"). After further reflection he wrote, "Actually, I think Mrs. Duque is making it unnecessarily difficult. First, I would have my wife skin the elephant and make it airtight by applying scotch tape to any leaks. Then I would find a 10-foot step-ladder. I would have my wife climb to the top of the ladder and hold the elephant up by his ears. Then I would simply blow him up, the way my grandson blows up the swans in his swimming pool. I realize an elephant holds a lot of air, but of course we would take turns holding and blowing."

Admitting that Jeanne had been pulling his leg, Jack Smith then quoted parts of her excellent description of the taxidermy process:

"'Infinitely patient experts take hundreds of measurements to provide the taxidermist with the information he needs to re-create the animal in lifelike form, with only a tanned skin to start with and his own intimate knowledge of nature and form to guide him.

"'He is a sculptor and naturalist and his talents and methods of re-creation are legendary. He sculpts his subject in clay and then makes a sectioned plaster cast,

casts the animal's form in the most up-to-date medium, and then applies the original skin with folds, muscles, age wrinkles, battle scars — everything showing to make him come alive again . . ."

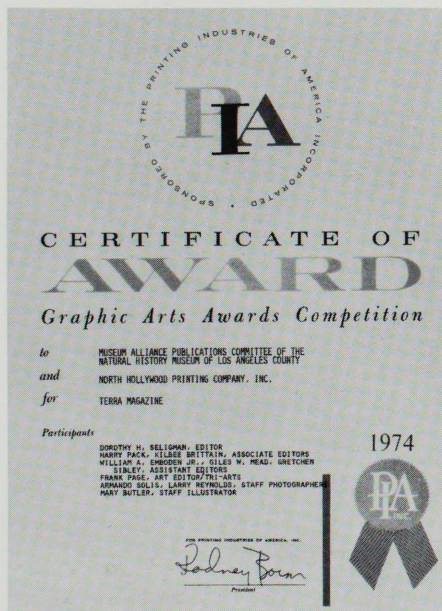
Jack Smith concluded, "So, you see, there's a lot more to stuffing an elephant than a person might think."

We might add: there's a lot more to being a docent than a person might think.

Anyway, Mrs. Duque has invited Mr. Smith to take a docent-guided tour of his stuffed animals.

Terra Award

TERRA has received a prestigious award for excellence in graphic arts from the Printing Industries of America, Inc., which through competitive judging chooses several outstanding publications for this honor. Sharing kudos with TERRA editor Dorothy Seligman at the summer awards luncheon were Harry Pack of Tri-Arts, which designs TERRA, and Tex Hamilton, President of North Hollywood Printing Company, TERRA's printer.



Letters

Just a word of commendation for the Natural History Museum's consistently excellent Quarterly, *TERRA*

Somehow your staff manages to provide well-written articles on an extraordinary range of topics, issue after issue, with layout, graphics and printing worthy of top quality commercial periodicals.

Since *Terra* is indeed *not* a commercial publication, I daresay much of your staff work is done by dedicated volunteers,

continued on page 31



The Members magazine of
THE NATURAL
HISTORY MUSEUM ALLIANCE
of Los Angeles County
VOL. 13 / NO. 2 FALL 1974

contents

Kirlian Photography
and Plants **3**

Tourist,
Made in Los Angeles **10**

Turquoise,
Stone of the Ages **16**

Housewife
on a Reef **27**

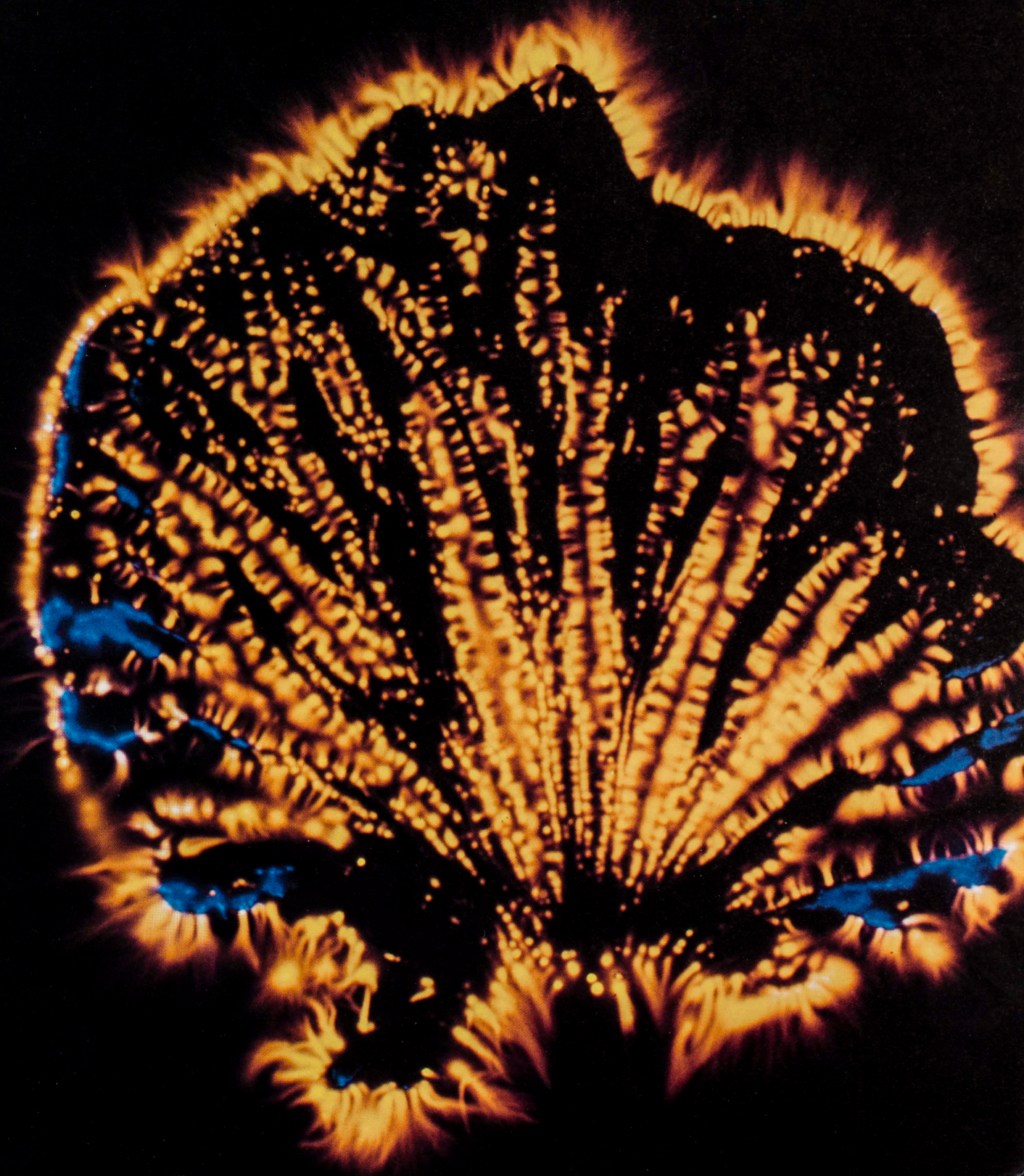
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Kirlian Photography and Plants

An Interview With Dr. Thelma Moss
by William A. Emboden



Few areas of research are as controversial as parapsychology, and I might append a corollary to this: few individuals in this area are executing investigations as controversial (and as fascinating) as that of Dr. Thelma Moss at the University of California at Los Angeles. When I suggested to Dorothy Seligman that it would be interesting to bring a figure such as Thelma Moss into TERRA, I did so with trepidation, first being aware that I knew nothing of the discipline other than popular accounts, and secondly the scientists within this Natural History Museum and those who are among our readers might take exception to the exploration of an area of research that has been exploited by the media as being both weird and fraudulent.

It was the temerity of Dorothy Seligman that brought us to the laboratory of Dr. Moss. With her usual candor, Dorothy made a phone call to the laboratories of Thelma Moss and secured an invitation. On Thursday, May 20, we ate a delicious lunch in "the village," dashed to Dorothy's home for the tape recorder that we had forgotten and sped to the UCLA Medical Center.

Entering those labyrinthine hallways, I remarked on the decided possibility of turning a corner and encountering a minotaur; instead we burst into the office of a petite woman with dark sparkling eyes and an almost Piaf voice busily accommodating a visitor, handling phone calls, directing her two assistants, John Hubacher and Frances Saba, while making us welcome.

We had time to scan the laboratory and note the frequent photographs of leaves, hands, and flowers with an unusual aura about them. Against the window stood a rack of ravishing slides of things not so easily identified, but exquisite in their seemingly abstract composition of colors. One familiar element was a framed photo of the hand of God in proximity to that of man as painted by Michaelangelo; the juxtaposition having caused many a critic to state that there seems to be almost a visible spark between the tips of these graceful fingers. Thus, the painting did not seem at all out of place in the wealth of biological photographs.

Having been introduced to the staff of the laboratory—stalwart John Hubacher, bearded and with a comfortable air about him, and Frances Saba, whose presence bespoke sophistication and reservation, making one suspicious that she was in reality a model for some fine designer—we proceeded to watch a slide show of splendid "Kirlian photographs" (in no way ordinary) of leaves with the strangest emanations of light emerging from the margins and

equally bizarre "bubbles" traversing the vascular system of these leaves. Many of the plants from which they were taken were growing happily on the windowsill beside us, others from around the Medical Center. I boldly advanced the question, "What are these bubbles and what is the aura of light surrounding the leaves?" I rather anticipated a complex parapsychological answer which would be too obscure for my understanding, or a bizarre spiritual explanation relevant to the soul of the plant. Instead with absolute wonder Dr. Moss said, "We don't know, and we had hoped that you might be of some help in interpreting this for us." Rarely have I felt quite so inadequate. Beyond making note that the greatest intensity of the aura concurred with the position of hydathodes (vascular openings at the leaf margins), and the observation that a certain luminescence paralleled the position of leaf hairs, or trichomes). "Perhaps," I indicated, "the auras might be indicative of metabolic activity which is considerably greater in trichomes as indicated by the frequency of mitochondria." This still left much to be explained. How about those leaves that gave little indication of an aura and then after certain individuals had held a hand over the leaf it was rephotographed and the aura intensified or disappeared. I attempted to explain it as possibly being differential hand temperatures or metal jewelry. These had to be ruled out, as both variables had been explored to the point where some individuals first dipped their hands in ice water before holding them above a leaf, and the presence or absence of jewelry had no effect. Not all persons are successful in this endeavor, so it was incumbent upon both Dorothy and myself to try our fortunes at this. I suggested using a leaf of *Plectranthus australis* that had an old necrotic area on one side.

Grouped together in a photographic dark-room (formerly a sensory deprivation chamber) under the eerie glow of a red light, we watched John place a 4 x 5 inch Kodak Estar thick-base, black-and-white film on the dielectric plate of a Dakin instrument (recently devised by Henry Dakin of San Francisco). The leaf was placed on the film and covered with a thin glass plate to hold it flat against the film. On top of this plate a fairly heavy dielectric cube was placed in order to give as uniform a pressure as was possible over the leaf. Then the leaf petiole was touched with an electrode for .3 seconds using 15,000 volts. The negative was processed and there it was—a leaf with a fine aura (corona discharge or bioplasma aura, as it is called by those who work with this instrument). Only the necrotic area of

the leaf lacked any aura. Dr. Moss asked if I would mind briefly holding my hand a couple of inches above the leaf, which I gladly did. We then took a second photograph. To my astonishment the negative revealed a much greater aura; I had not touched the leaf, but merely consciously dilated my fingertip capillaries (something I learned to do sometime ago through deliberate concentration). This increase in the aura is called both the "healing effect," and the "green thumb effect." Regardless of what it is called, clearly there is a difference before and after the "treatment." Dorothy attempted to do the same and succeeded as well (although confessing, "My aura isn't as big as yours, Honey!"). We had both demonstrated what Dr. Moss calls the "green thumb effect."

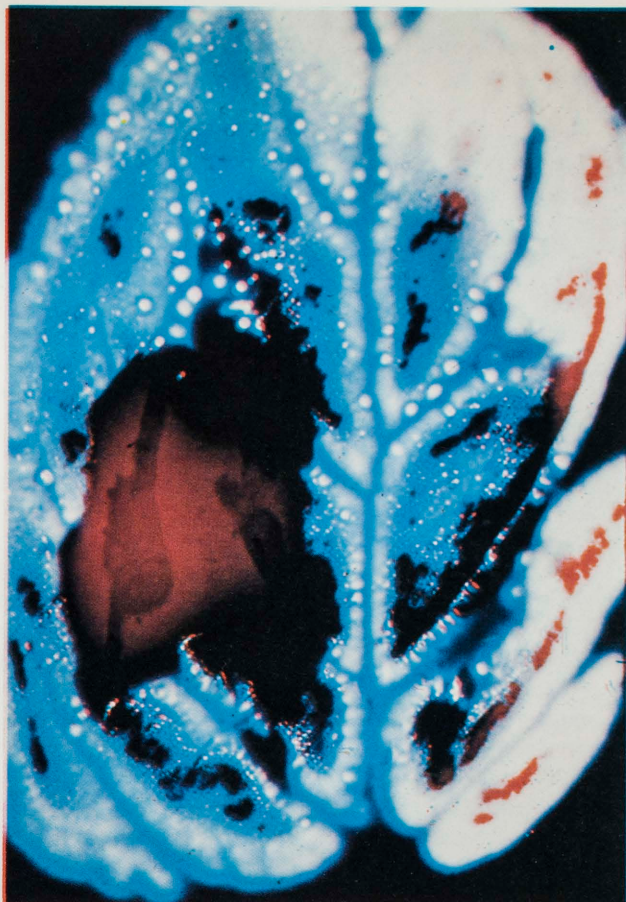
In opposition to this is the "brown thumb effect" in which certain individuals repeatedly get no aura, or diminish the existing aura about the leaf. We were all delighted, although not really understanding what we had accomplished. As a botanist trained in scientific methodology, it was obvious to me that there was no deception involved; we were simply witnessing a phenomenon, in which we had participated and altered the results, for which we had no explanation in ordinary scientific terms.

For the reader it might be well to interject some information on the "scientific method." Science is itself both a procedure and a body of data accrued by the use of a procedure; i.e., the scientific method—identifying a problem, establishing a hypothesis, outlining the approach and instrumentation necessary to solve that problem, establishing and controlling variables, arriving at some results and repeating the testing procedures to see if the results can be duplicated. Repeatability and broad applicability may lead to what is known as "a natural law." Natural laws, however, do not pronounce absolutes. Science does not deal with absolutes, only with viable hypothesis that are demonstrable. Fact and truth are only temporary and are relevant to the "act of faith" made in the scientific method. It is a discipline that like others is pragmatic—it works. There is much left to be clarified by science, and there are problems to which the method is not applicable.

Perhaps the most intriguing of Dr. Moss's photographs was that of the "phantom leaf." A leaf had been gashed (John has become known as "John the Gasher") and a portion removed. It was then "photographed" somewhat in the manner described, but using a copper plate. The result was astounding! The leaf had recreated an image of the missing portion exactly cor-



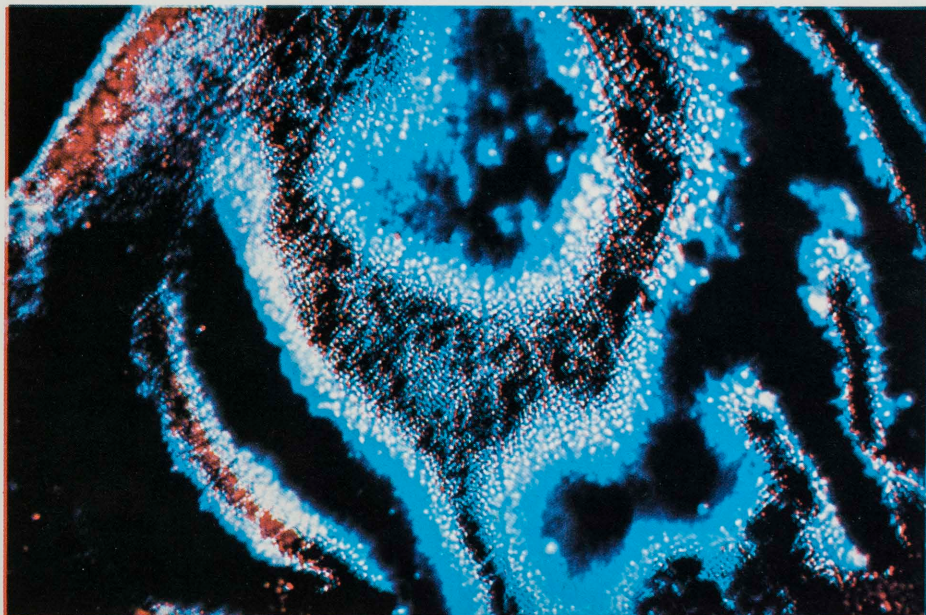
Gazania leaf prior to "gashing".



Gazania leaf "gashed".

5

Yellow rose petal



responding to that part which had been removed. It was not due to any residue on the plate as it was excised before placement. Immediately the "phantom limb" phenomenon came to mind. Amputees frequently have a sense of a phantom limb long after the real limb has been removed. They may have a concept of its exact length or size (which may not agree with ordinary size of the missing limb), and it may pain them or itch, etc. But in the case of the "phantom leaf," the missing portion recreated itself. The best example of this is framed in silver and hanging on the office wall of Dr. Moss.

Apparently not many scientists choose to visit Dr. Moss, especially botanists; she is a genial person who welcomes visitors and information and is quite open to ideas. The scientific community has a tendency to shun the individual who is doing research in which the results are so astounding and so contradictory to that which is known. Certainly Dr. Moss's research is well known enough to expect that a host of scientists would be intrigued. Perhaps they are waiting for parapsychology to become more respectable. In the meanwhile, Dr. Moss informs us, Russia is carrying out numerous experiments much akin to her own.

My enthusiasm over the phenomena which I had witnessed thus far led me to suggest that it would be interesting to use her methods in studying plant tumours common to willows, oaks, poplars, etc. If this study reflected increased metabolic rates as I suggested, then it would follow that in tumours, in which rates of nuclear division are considerably greater than normal tissue, then the photographs should reveal a more pronounced aura. Frances and I ran to the botanical garden where the willows exhibited numerous pronounced leaf and stem galls. The sawfly (*Pontania californica*) had oviposited into many of the leaves causing the plants to produce a series of thick rounded structures near the primary and secondary veins. These tumours of the willow (*Salix* sp.) often develop abnormal coloration (anthocyanins) and have an anatomical structure completely different from that of the host plant. What is of particular interest is that the rate of mitoses (nuclear divisions) is much greater in the gall tissue than in surrounding ordinary leaf tissue. Frances and I literally ran back to the laboratory (partly in enthusiasm and in part to meet John's schedule). I began busily slicing thin sections of the galls and equivalent sectioning of normal laminar tissue. These were subjected to the conditions previously outlined with the most astonishing results; the lami-

nar normal tissue showed an aura such as we might anticipate with most living tissue whereas the gall tissue revealed a dramatic aura, looking like the focal point of a lighting storm. The differences were so dramatic that had I not been involved, I would have been inclined to considerable skepticism.

At the beginning of these experiments, Dorothy had to meet other commitments and left (having taped our conversation to that point). John had an appointment also, and although the day was waning, I had no desire to leave Dr. Moss or any of the people in the laboratory. More visitors had arrived in the interim and the phone was beginning to ring. Dr. Moss was beaming with the same, if not greater, enthusiasm as she had been directing this work and was washing the negatives anxiously awaiting the outcome. This new area of endeavor seemed to preoccupy her until a request was made for some movies of "Kirlian photography." A process of recording these events on film had been devised by John. The prevailing mood of gaiety ceased. No, she would not allow her work or her laboratory to be incorporated into a film on the American way of life (along with a pie-eating contest). The struggle to maintain a laboratory where original, controversial research is taking place and to avoid exploitation brought out the fire in Dr. Moss. She has not been reluctant to publish her photographs or her techniques for obtaining these photographs (unlike most of the Russians), but she has been adamant about avoiding sensational misrepresentation, and the lioness is revealed when the attempt is made. It is precisely this unique combination of modesty, simplicity, and inquiry combined with a tremendous strength that makes this personality so compelling. No grant money runs this laboratory, rather ingenuity (including John's natural feel for instrumentation and the perceptive insights of Frances), and perseverance in spite of no outside support. One gets the decided impression that here in a small corner of a gigantic institution there is a nucleus of activity that may do more to shape the future of biological activity than many of the other activities in this complex of scientists. When, and if, this hard won victory is achieved, it will be an enormous credit to one woman who has an enormous imagination fortified by the necessary intellect to achieve something in spite of prevailing attitudes among colleagues.

I would like to know what the Russian scientists mean by "the cold emission of electrons" which produces the "phantom leaf" effect. I would be terribly interested in

attending an international symposium on parapsychology, and it would be most interesting to work with this phenomenon and seek explanations for "this subtle, invisible field which pervades living matter."

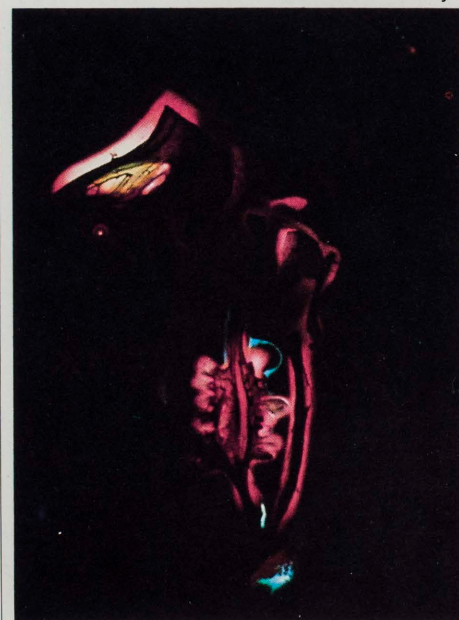
As for my relationship with Dr. Moss, I see it as the beginning of a cooperative endeavor that may just turn out to be the most exciting period in my career as a botanist.

Dr. William A. Emboden, writer of books on such diverse subjects as Bizarre Botany and Sarah Bernhardt, has the inquiring and open mind of all true discoverers. (ed.)

Dr. Thelma Moss is a professor in the Department of Psychology at UCLA. Her innovative research on Kirlian photography has brought her world-wide recognition.

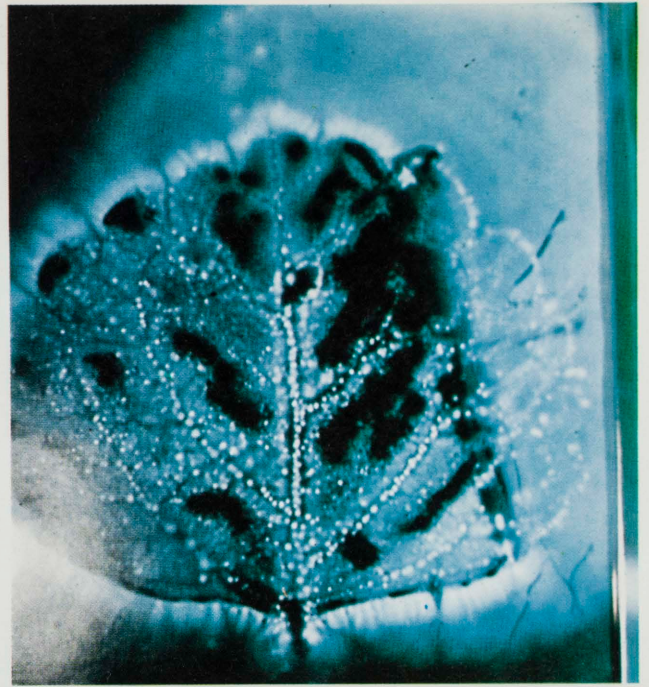
Note: All photographs in this article are published through the courtesy of the laboratories of Dr. Thelma Moss, Department of Psychology, Neuropsychiatric Institute, UCLA. All of these Kirlian photographs were made without the use of a camera or lens.

Interior of "naked lady"





Gaseous "Phantom" (right of cut) (African Violet).



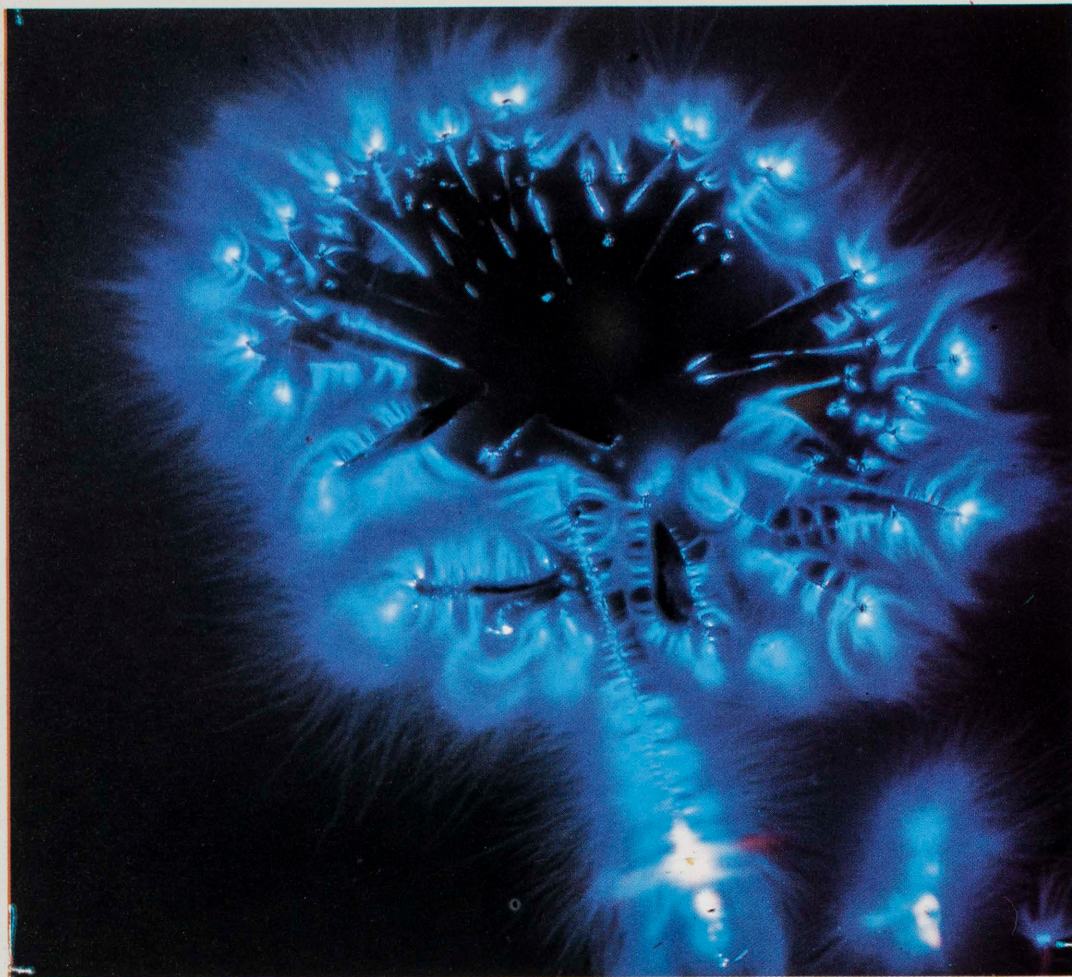
Phantom leaf (African Violet).

Petiole of Calla Lily



Hibiscus petal



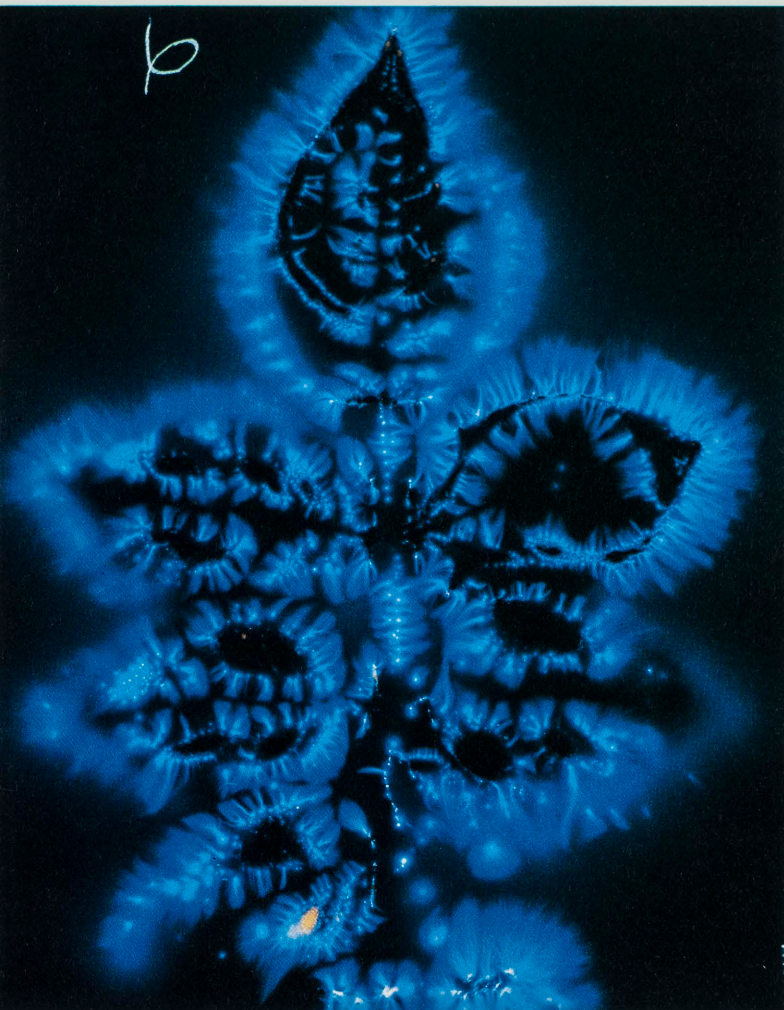


Myrtle (Myrtus)

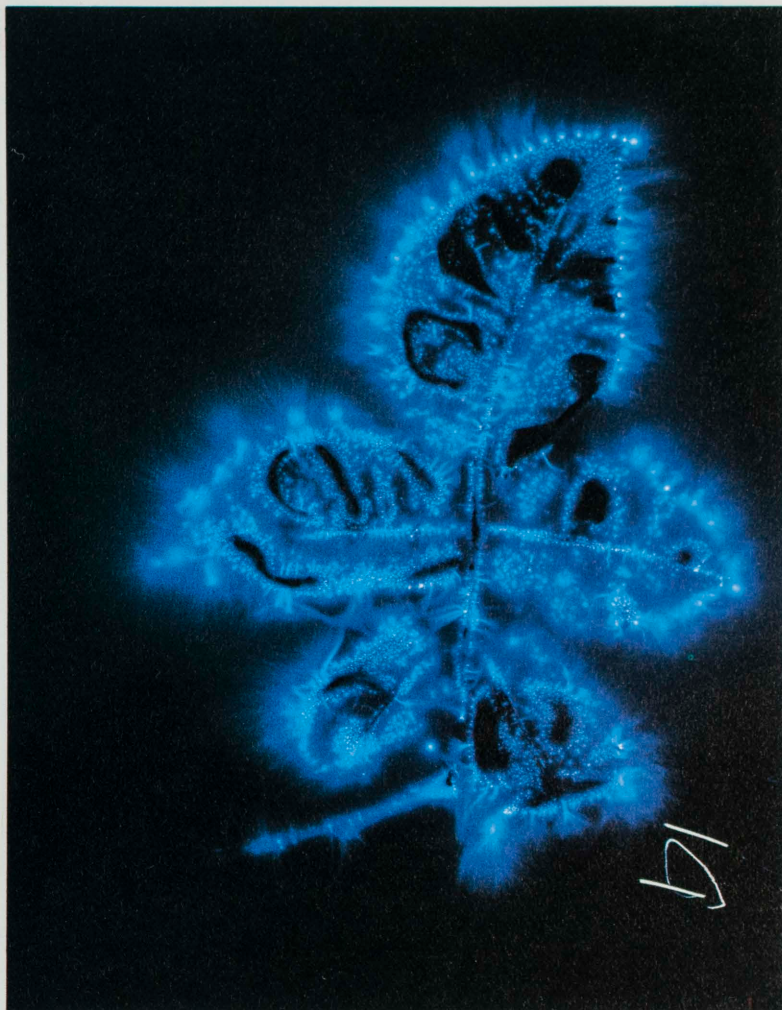
Callistemon anthers (bottlebrush).



Dr. Thelma Moss and Mr. John Hubacher at work on the Kirlian equipment. A fungus is being "photographed".



A "healthy" rose leaf



A rose leaf infected with fungus (mildew)
note the reduced aura.

Ms. Frances Saba examining Kirlian
photographs and recording data.



AUTO VEHICLE CO.
Tourist
MADE IN LOS ANGELES.

943 N. MAIN ST.

by James Zordich

10

Los Angeles, although originally noted as an agricultural center at the turn of the century, was also the focal point of an industry which produced everything from sinks to automobiles. The introduction of the automobile into Los Angeles was very slow. By 1900, the commercial production of automobiles was just beginning in the East. Coupled with an initially small production and relatively high shipping expenses, few cars were distributed in the West. Within four years, however, the picture had changed and Los Angeles did display automobile dealerships representing most of the major manufacturers.

Without proper roads, repair stations or parts depots, there was very little incentive to own and operate an automobile in Los Angeles. For the most part, the only paved streets of any consequence existed within the business district of the city. The outskirts and rural areas were accessible only by dirt and or gravel roads which were rendered useless for days following the heavy winter rains.

Despite the many drawbacks that Los Angeles offered the automobile producer and owner, or perhaps in response to these negative aspects, change was inevitable and an automobile industry did develop in Southern California, for many of the same reasons as it did in other parts of the country: to supply the demand for depend-

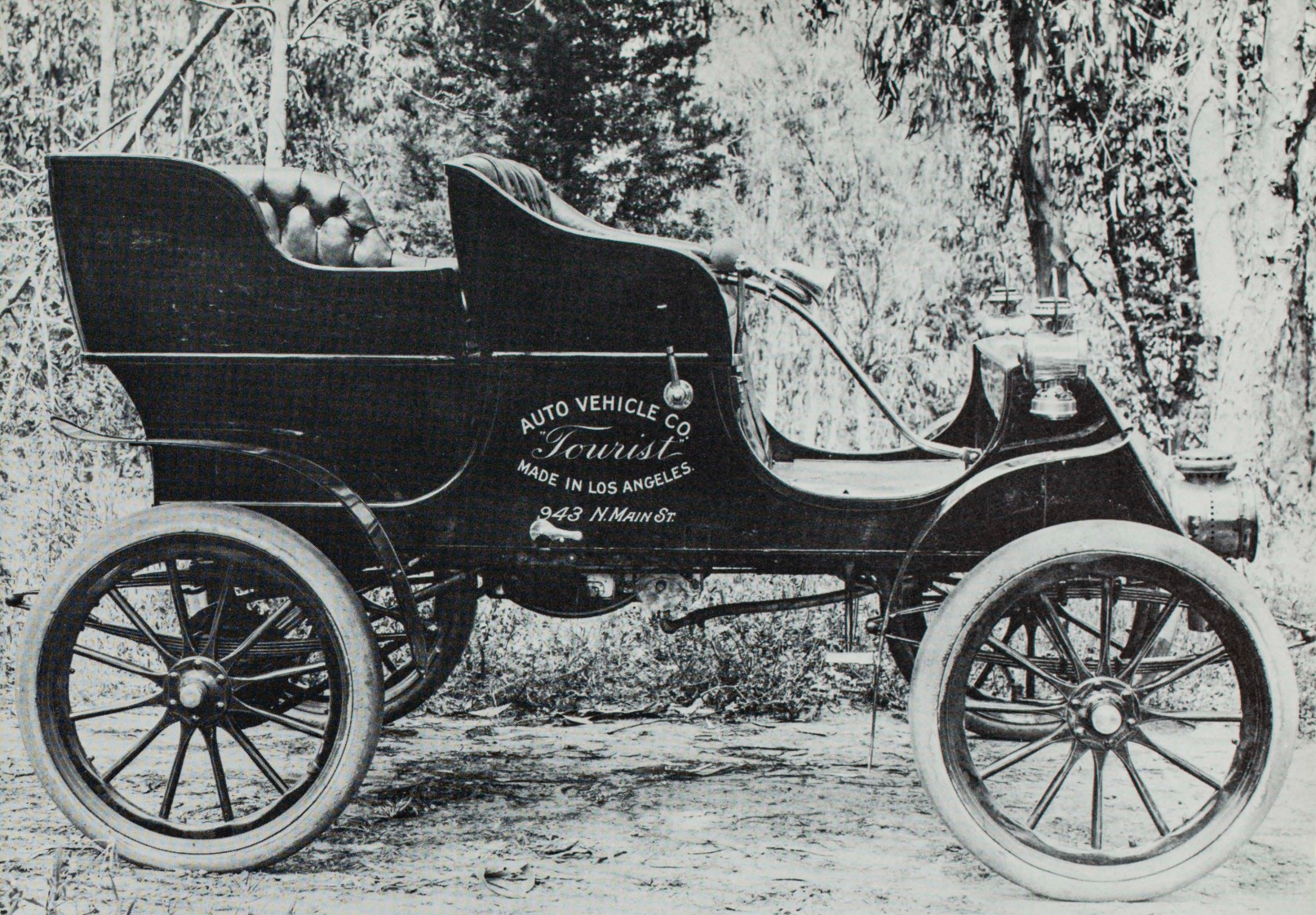
able personal transportation and to capitalize on the economic advantages offered by the new industry. The most significant and the earliest of the pleasure automobile manufacturing companies in Los Angeles was the Auto Vehicle Company, producers of the TOURIST automobile.

The Auto Vehicle Company was incorporated under the laws of California on May 5, 1902 with a capital of \$250,000. The company's founders and directors included: W. F. Botsford, president of the California Bank; W. D. Longyear, cashier of the Security Savings Bank; I. B. Newton, of the Harper-Reynolds Hardware Company; W. H. Allen, Jr., president of the Title Insurance and Trust Company; and Fred L. Baker, of the Baker Iron Works.

After some searching, the directors of the company chose an engine for the new automobile that had been engineered and produced by Waldemar G. Hansen of Pasadena. Mr. Hansen owned the Pasadena Machine Shop, which he had founded after his graduation from the Throop Institute of Technology (now known as Cal Tech). The Auto Vehicle Company purchased Hansen's machine shop, keeping only a large milling machine and the engine which he had produced. W. G. Hansen was retained as a foreman, receiving Auto Vehicle stock in partial payment for his equipment and designs.

With a vehicle design and a new engine in hand, the Auto Vehicle Company had to find a home in which to produce its new car. The former plant of the Standard Iron and Brass Works at 943 North Main Street was acquired, new machinery installed, employees hired and all was in readiness. *Horseless Age* magazine for September 17, 1902, reported that the first TOURIST automobile was being tested, and by October 22, automobiles were in production. However, there is no record of the first sale that year. Only seventeen cars were produced during the first year. All of the cars were identical with a capacity of four persons, powered by a two-cylinder, horizontal opposed engine with a 4½ inch bore and 4 inch stroke, jump spark ignition, planetary transmission and chain drive to the rear axle. For the most part, all of the components were made in the factory. Engine cylinders were cast by the Western Gas Engine Works, also located on North Main Street.

Reports of the new Los Angeles company and its product were rarely reported in the Eastern published trade periodicals. As might be expected, excellent coverage was afforded by the local trade publications, such as *Pacific Automobiling*, published in Los Angeles. By 1903 the publicity advantages of automobile racing had become apparent and the Auto Vehicle Company



The first TOURIST automobile was produced in 1902. It was a rather plain looking automobile, with a frame made from angle iron supported by four full-elliptic springs. The finish was black

accentuated by polished brass hardware, white tires and maroon upholstery. The rear-entrance tonneau was capable of comfortably seating two persons.

was intent on securing its share, a fact that did not go completely unnoticed by the Eastern trade publications.

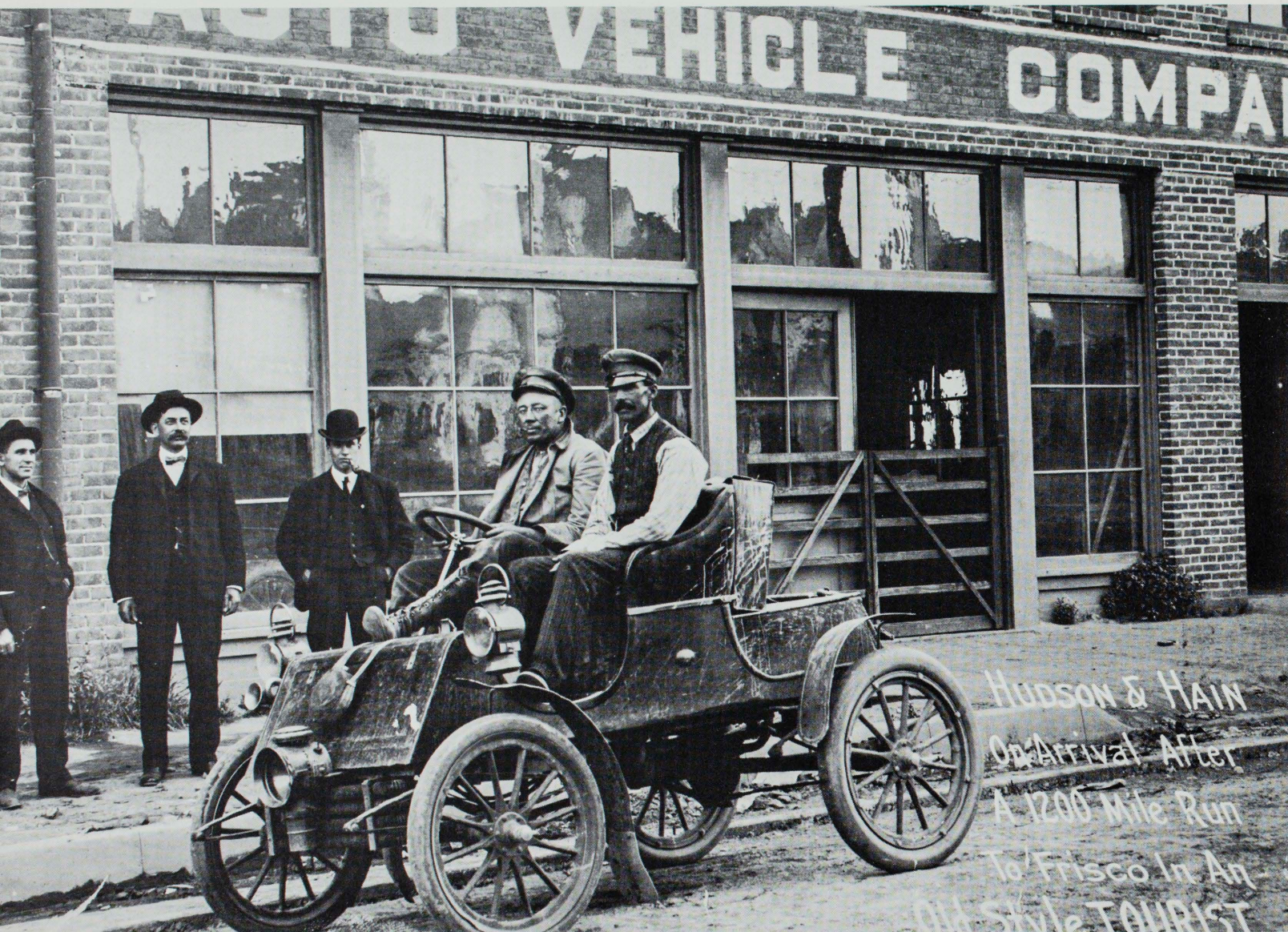
To begin its long association in automobile racing the Auto Vehicle Company first participated in a series of races sponsored by the Automobile Club of Southern California on November 20-21, 1903, at Agricultural Park (now known as Exposition Park). The TOURIST was represented in these races by W. G. Hansen using two vehicles: a hybrid racing machine he had designed and built, and a specially modified 1902 model. Although the TOURIST did not achieve a spectacular success, it did effectively publicize the company's name and its product. It was this philosophy which found TOURISTS entered in almost every Pacific Coast race or hill climb until almost the end of production.

Watt Moreland joined the Auto Vehicle

Company late in 1903 as designing engineer. Prior to that time he had been associated with the Magnolia Automobile Company of Riverside, California. That company was first announced in the September 17, 1902, issue of *Horseless Age*, but an automobile had not been produced until May, 1903. Moreland remained at the Auto Vehicle Company until late 1908 when he left to join the Durocar Manufacturing Company, located cater-corner from the TOURIST factory at 9th and Los Angeles streets. In 1912, the Moreland Motor Truck Company was incorporated and began production in 1913. It soon became the major commercial vehicle producing company in Los Angeles.

In 1904, one hundred and fifty cars were produced, but unlike the two prior years, two models were offered. The first of the two models offered was radically different.

Watt Moreland designed a new engine which was placed in a transverse position under the hood behind a Whitlock radiator. The engine was still two-cylinder, horizontal-opposed with an enlarged 4½ inch bore and a 4 inch stroke rated at 15 horsepower. The planetary transmission and chain drive were not used and in their place was installed a three-speed progressive transmission connected by a drive shaft to the Brown-Lipe differential. The car was still available with a rear-entrance tonneau which permitted the total seating of four passengers. The second model was less expensive, but still used a planetary transmission and chain drive powered by a 12 horsepower, two-cylinder, horizontal-opposed engine with a 4 inch bore and 4 inch stroke. It, too, was available with a rear-entrance tonneau, but weighed only twelve hundred and fifty pounds—three hundred



pounds less than its more expensive brother.

There not only had been changes made in the automobile but in the company, as well. Waldemar Hansen left, divesting himself of any interest in the company. The proceeds from the sale of his Auto Vehicle Company stock were utilized in the founding of a new machine shop known as the Hansen Auto & Machine Works of Pasadena. In 1907, in cooperation with L. L. Whitman, he produced ten automobiles under the name Hansen-Whitman. In the years following, he manufactured the drive mechanism for the dome of the Mount Wilson telescope. Engine design and construction were W. G. Hansen's true calling, and in 1909 an aviation engine project financed by L. L. Snow was begun. One unit was completed and was scheduled for testing by Arch Hoxie, who served as an

apprentice machinist under Hansen at the Auto Vehicle Company. Hoxie was killed in an aviation accident at Dominguez Field in 1910, before the new engine was ready for testing. It was not until 1911 that this engine was placed in actual service on a passenger dirigible operated by Roy Knabenshue.

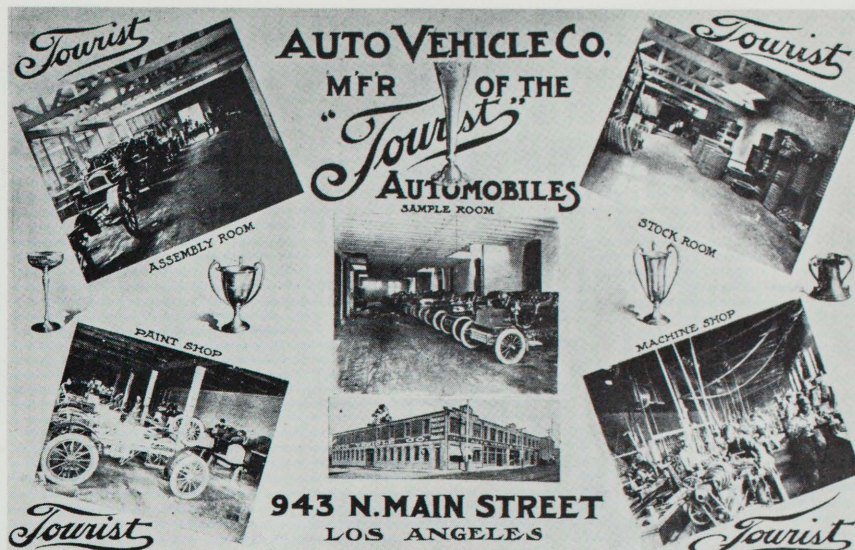
Linford C. Lull, a former carriage maker from Kalamazoo, Michigan joined the Auto Vehicle Company early in 1904 to serve as manager. From the beginning Lull was concerned with increasing production. At that time the factory contained over 20,000 square feet of floor space and employed fifty men. Production was increased and the plant at 943 North Main Street soon became inadequate. For the most part the total output of production was consumed locally. Despite that fact, the company did display an automobile at the 1904 St. Louis World's Fair. Even in later years the

territory covered by TOURIST dealers was small and primarily concentrated in the West.

On January 1, 1905, the Auto Vehicle Company purchased the building lease and the unliquidated stock of the Parrott Carriage Manufacturing Company located at Tenth and Main Streets. While the remaining stock of Parrott carriages was being liquidated, the factory equipment and stock were removed from the 943 North Main Street plant. The liquidation of the former Parrott carriage stock continued through the end of January. On March 5, 1905, advertising for TOURIST automobiles was resumed. Owing to delays in production, attributable to the move of the factory, only one hundred and thirty cars were produced during the year. Production still consisted of a two-cylinder, horizontal-opposed engine powered automobile, although experimen-

Photographs of the 1903 TOURIST are very rare. This photograph is unique in that it was taken in front of the first factory at 943 North Main Street, Los Angeles, California. By this time the body had begun to take on a more box-like appearance. A steering wheel and coil-and-fin radiator were a few of the changes made during the year.

One of the earliest advertisements for the TOURIST automobile consisted of this series of photographs taken in 1904. The factory was small, but the automobiles sold well and soon new quarters were sought. The total effort of the factory at this time was devoted to the production of two-cylinder models.



Parked alongside the TOURIST factory at 10th and Main Streets are examples of the new 1906 two-cylinder, Model K and the four-cylinder, Model N. Many of the lettered signs on the factory building and awnings were remnants from the former tenant, the Parrott Carriage Manufacturing Company. Completed TOURIST automobiles are readily visible in the showroom windows fronting on Main Street. Delivery entrances to the factory were located at the side on 10th Street.



tation on a new automobile using four-cylinder engine was completed during the year. At the same time, experimentation was also underway on a new two-cylinder, horizontal-opposed engine of "L" head design. This design was also approved and placed in production at the end of the year.

The new factory was operating normally by 1906. Two new automobiles made up the line: a four-cylinder and a two-cylinder, horizontal opposed. Out of four hundred automobiles produced during 1906, eighty-five percent were two-cylinder models. In fact, the two-cylinder TOURIST was the most popular of the company's products and remained so until the close of business.

The dawn of 1907 found the TOURIST factory operating at peak capacity. In fact, an expansion of the factory building increased the floor area to more than 160,000 square feet. The year's catalog,

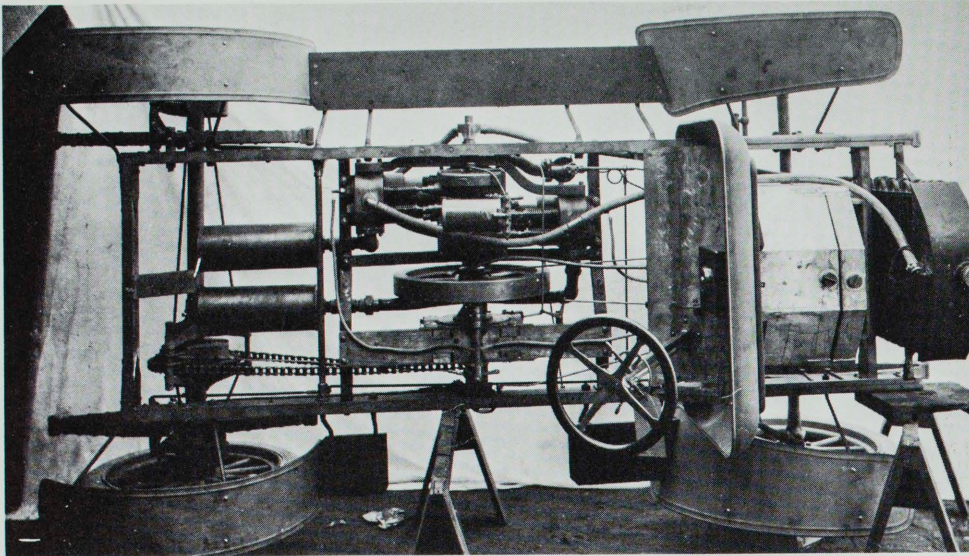
among its other slight exaggerations, said two hundred and fifty men were employed at the factory. TOURIST automobiles could claim many triumphs for the prior year and 1907 was not to be an exception. In addition to its racing publicity, the Auto Vehicle Company also effectively marketed its product at the automobile shows. As might be expected, TOURIST automobiles were exhibited at nearly all of the Pacific Coast shows. The one exception was a TOURIST display at the Chicago Automobile Show in February, 1907.

Volney S. Beardsley, who started with the company as a salesman, was made sales manager and supervised both the sales made from the showroom at the front of the factory as well as the distribution to the dealers. Like many other people who had been associated with the Auto Vehicle Company, V. S. Beardsley continued in the

automobile business after the factory closed, forming the California Automobile Company in 1910. Located at 950 South Main Street, he sold Firestone-Columbus and Warren-Detroit automobiles. In 1915, he produced and sold the Beardsley Electric which was produced until 1917.

TOURIST automobiles were guaranteed for one year, covering any part that broke within the guarantee period, but excluding tires. Replacements were made without cost, under the usual condition of proper care and maintenance. To quote the catalog: "A guarantee backed by a manufacturer who is located from 3,000 to 4,000 miles from you is of little help when you are in trouble."

Toward the end of 1907 the Auto Vehicle Company began to experience some financial difficulty. Slowly the work force was cut down, but that was not sufficient, so the



Photographed behind the TOURIST factory, this 1906 Model K was tipped on its side, the frame supported on sawhorses and the wheel hubs resting on wooden boxes. The white sheet was used to opaque the background. Everything that made a TOURIST run was clearly exposed.



Located on the second floor next to the paint department was the two-cylinder room. The complete assembly of the two-cylinder Model K was completed in this area. Each chassis remained stationary until completed and ready for road testing. The partially completed chassis were unpainted and remained so until after final testing.

14

whole factory was closed on November 2, 1907. As might be expected there was a great deal of speculation about how and why the factory had closed, and when it might reopen. There was some thought that the plant would reopen by December 10.

In one way or another the directors of the Auto Vehicle Company were able to reopen the factory. The new year had barely begun when L. C. Lull, the company's manager, died suddenly while on a trip to Detroit. Despite the interruption in the company's management the TOURIST exhibit at the San Francisco Automobile Show went on as scheduled.

The firm weathered the tragedy, and sales during 1908 were excellent. J. S. Conwell, formerly the company's northern sales manager, an area which included northern California, Oregon and Washington, was selected to serve as the new

company manager. Hazlitt L. Pelton, of Fresno, was given the managership of the northern territory, while Walter Sahland continued in his post as southern sales manager. Prior to his association with the Auto Vehicle Company, J. S. Conwell had served as manager of the Marion Automobile Company and before that as manager of the Waverley Electric automobile factory.

Production continued in 1908 for the most part as it had the year before. No new models were introduced during the year; in fact, there were no obvious changes in the existing line. Despite the fact that the standard line was stratified, the factory offered custom design and production of commercial vehicles using a four-cylinder, 50 horse-power chassis. One such vehicle was a combination hose and chemical engine, built for the Hollywood Fire Department. The production of commercial vehicles

was never of financial importance to the company.

Business continued at a brisk pace. The *Motor West* magazine of August, 1908 reported the following account: "Walter Sahland of the Auto Vehicle Company returned last week after a trip through Texas, Arizona and New Mexico. He said business conditions were good, the automobile trade especially brisk in El Paso. The Southwest Motor Works of El Paso will continue to handle TOURISTS in their territory."

For the first time in over a year some changes had been made in the line of automobiles offered for 1909. The two-cylinder engines were increased to 24 horsepower. The newest model of the line was the Type H which was available with either a four-cylinder 40 or 50 horsepower engine. In addition to the change in the

Several models of TOURIST automobiles were exhibited at the San Francisco automobile show of 1907. The most prominent feature of the TOURIST display was the polished Model N chassis pictured on the left.



Publicity was a basic part of the Auto Vehicle Company's philosophy in selling automobiles. The sign on the hood of the new 1909 TOURIST, Type H, clearly announces the message of this sales promotion.



automobiles, there was also a change in the management of the company. Volney S. Beardsley was made the manager of the company. For the most part the philosophy under which the company operated had not changed. TOURIST automobiles were still vigorously publicized.

Toward the end of the year financial difficulty was again on the horizon. In an effort to cope with the problem, production was reduced. In November the Northern California distributorship of TOURIST automobiles was dissolved and Hazlitt Pelton, the former northern agent, secured the Northern California distributorship for the Columbia automobile.

In 1910, TOURIST automobiles were exhibited at the Los Angeles Automobile Show in conjunction with the display of the California Automobile Company, which also represented Firestone - Columbus,

Warren-Detroit and California automobiles. The California automobile had formerly been known as the TOURIST, Model G. Volney S. Beardsley was the business manager for the California Automobile Company, which was a last-hope effort to keep the TOURIST automobile alive. This effort was short-lived, however, and the Auto Vehicle Company closed in September, 1910.

TOURIST automobiles are gone except for a few memories and a handful of cars now preserved by collectors and museums. The Natural History Museum of Los Angeles County owns the only surviving example of a 1902 TOURIST, which will soon be restored and placed on exhibit. Automobiles are still assembled in Los Angeles. But no longer is there a manufacturing plant capable of the work necessary to proclaim a car "Made in Los Angeles."

James Zordich is Associate Curator-Transportation Collections at the Natural History Museum of Los Angeles County. Prior contributions to this magazine include The First Car into Yosemite and Southern California's Magic Mountain, Mt. Lowe.

TURQUOISE

Stone of the Ages

by Robert Gaal

"The temple I frequent is high,
A turquoise-vaulted dome—the sky,
That spans the world with majesty."
Omar Khayyam

It is difficult to ascertain accurately how far back in history man first began to take an interest in turquoise. It is likely to have been at the very dawn of man's development, because color is associated with life at all stages, and the desire for and use of bright and colorful objects was and still is of great importance to man. Color was to the ancients and is today to modern man the most important quality of turquoise.

Blue and green have always held special significance for ancient cultures throughout the world. The Egyptian god Amon and the Hindu god Vishnu were represented by the color blue. Blue symbolized heaven to the ancient Chinese and in pre-historic Mexico it was the color of supreme authority. To the Indians of the Southwest, blue was heaven itself, or it represented one of the points of the compass; green was symbolic of earth. The Zuni related perfect blue turquoise to

maleness or masculinity, the Pueblo saw turquoise as a good luck charm; to the Hopi, turquoise was a symbol of good fortune and to the Apache it could invoke rain, while the Navajo also regarded turquoise as good-luck. Turquoise has remained almost unrivaled in its popularity throughout the centuries. Over 5000 years ago the Egyptians mined the attractive blue and green stones from the Sinai Peninsula and set them in some of the oldest jewelry known.

In order to place turquoise in some perspective to human history and its gemological significance, it is useful to review its history and usage through time.

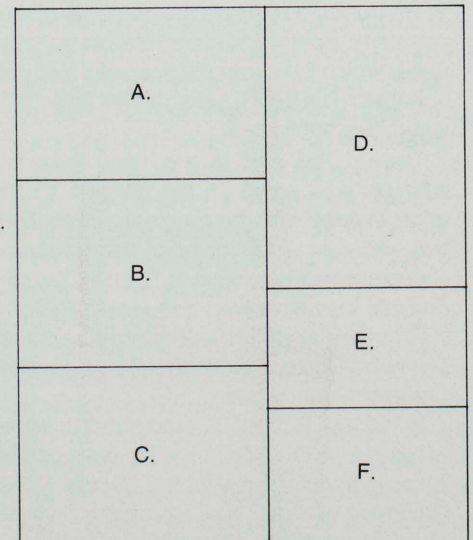
The history of turquoise must begin with some of the earliest recorded known mining operations in the world. Approximately 3000 B.C., i.e., about the first Egyptian Dynasty, the Pharaohs of Egypt mined turquoise from the Sinai Peninsula, which

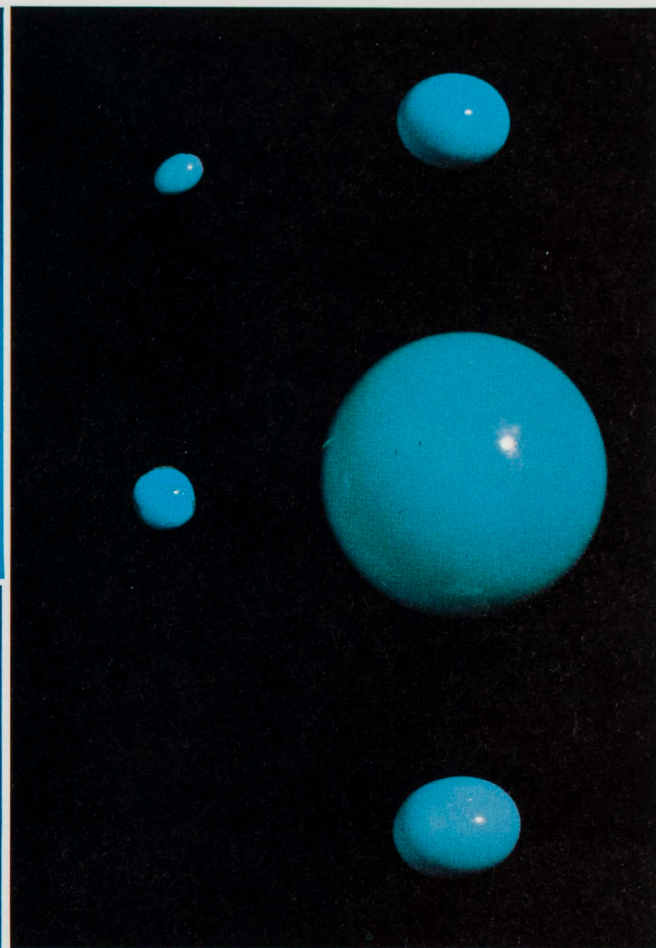
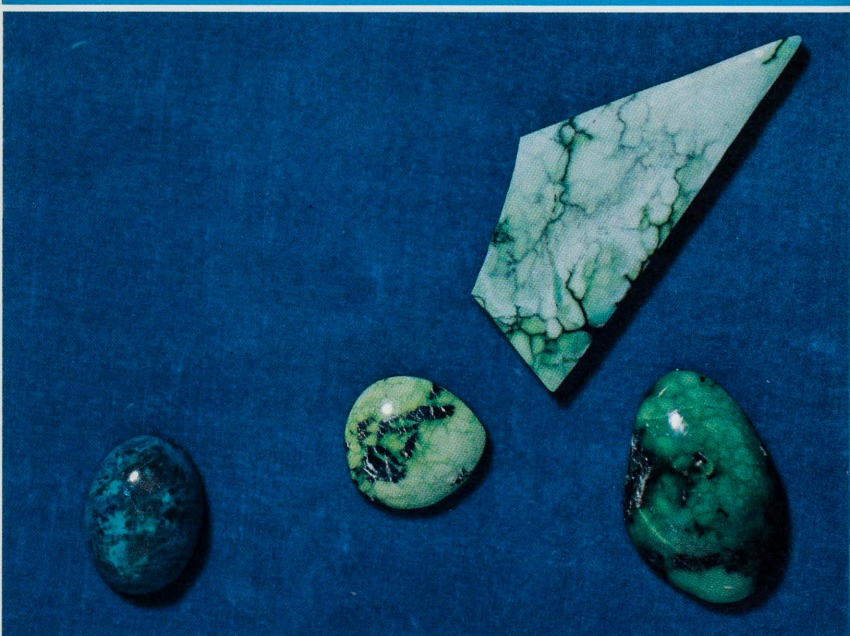
connects Egypt and Israel. Bracelets of turquoise and gold from the first Dynasty were unearthed at Abydos and are part of the oldest group of jewelry known in the world.

After the demise of the mines at Sinai, deposits in Persia (present-day Iran) were operating at least by 1000 A.D. on historical evidence and perhaps as early as 2100 B.C. Certainly, they have been worked since that time and have for centuries produced the bulk of the world's finest turquoise . . . and they are still producing today. The Persian deposits are located near Nishapur, the birthplace of Omar Khyayam, renowned Persian poet.

In the New World, the oldest turquoise artifacts appear in the South American Andean culture sequence of the Cupisnique dated from about 900-200 B.C. Turquoise mosaics have been found in

- A. Eliat stone.
- B. Bottom left, Shattuckite
Top right, Faustite.
Center, Faustite.
Bottom right, Faustite.
- C. Prosopite.
- D. Top left, glass.
Top right, synthetic turquoise.
Center left, top quality
Center right, plastic
Persian turquoise.
Bottom right, medium quality
Persian turquoise.
- E. Ceruleite.
- F. Top left, plastic matrix
turquoise.
Top right, bonded
turquoise.
Lower left, dyed Howlite.
Lower right, Turquite.





Middle Pre-Classic contexts from the Valley of Mexico and dated at 700-650 B.C. The source of Aztec turquoise is unknown; however, some speculate on trade with Indians north of Mexico in the southwest United States, or possibly an undisclosed area in Mexico itself—or perhaps through trade routes to South America. With Cortez's final victory over the Aztecs in 1521, ceremonial turquoise pieces from the New World were sent to Europe by the conquerors.

What is known of the use of turquoise in the southwestern United States is that significant prehistoric workings of turquoise deposits have been found in many areas of Arizona and New Mexico and in some scattered sites in California, Colorado, Nevada and Texas. Possibly the earliest use of turquoise by Southwest Indians is the association of two turquoise fragments with Vahki Phase material at Snake-town in southern Arizona, which are reported to have been made before 300 A.D. and possibly date back to a few hundred years before Christ.

Turquoise has been found in archeological situations sporadically from about 100 B.C. to about 900 A.D. throughout the southwestern United States. The incidence of turquoise in the Southwestern archeological record increases during the 10th and 11th centuries. In later prehistoric Southwestern culture, the importance of turquoise is indicated by the find of 65,000 turquoise artifacts, fragments and rough material at Pueblo Bonito in Chaco Canyon, New Mexico. The indications are that turquoise may have been a major prehistoric commodity. If so, a significant economic pattern must have been evolved in the Pueblo culture concerning mining, manufacturing, and commercial activities. Early trade in turquoise from the Southwest probably extended to Mexico City and Yucatan on the south and from California on the west to Canada on the north through the southeastern United States. Much of this prehistoric turquoise is believed to have come from New Mexico, especially from Mount Chalchihuitl in the Cerrillos district of Santa Fe County. However, many other prehistoric workings of turquoise deposits have been found in Arizona, California, Colorado and Nevada.

In California, extensive prehistoric workings of turquoise deposits occur in the Mojave desert region of San Bernardino County. Pueblo Indian turquoise miners from New Mexico made highly organized expeditions to the California mines and established extensive campsites from which numerous Pueblan artifacts have

been recovered.

Probably the first modern discovery, or rather "rediscovery" of turquoise in the United States was in 1858 at Cerrillos, New Mexico, by W.P. Blake. From the time of the Pueblo Revolt of 1680 until 1858, the occurrence of turquoise in America was not reported, although the earlier Spanish expeditions of 1540 and later missionaries in 1629 described the Cerrillo Mines. It wasn't until about 1897 that turquoise was rediscovered in California.

Since about 1000 A.D., the use of turquoise in the Southwest gradually evolved through the Indian culture to its present popularity today. Superstition and mysticism pervaded the turquoise scene, and unusual powers were attributed to turquoise, much the same as with the ancient Egyptians, Persians, Chinese, Greeks and Romans.

Although turquoise deposits occur elsewhere in the world, such as southwest Asia, Tibet, China, Europe, Australia, South America and Mexico, the bulk of gem turquoise production seen in America is now produced in the southwestern United States.

History is not clear regarding the origin of the word turquoise. Data is obscure, and there is much confusion and speculation over existing information. The derivation favored is that it comes from the 13th century French *pierre turquoise* meaning "Turkish stone." Unfortunately, the name "Turkish stone" is misleading because turquoise is not mined in Turkey. The major sources of turquoise then were and still are the mines of Persia. Consequently, the name may have evolved because turquoise was sold to European traders from marketing centers in Turkey. Therefore, turquoise was introduced into Europe from Persia through Turkey, hence the name "Turkish stone."

Turquoise may have been called *Mafkat* by the ancient Egyptians. Although it has other translations, including "green stone" and malachite, some authorities believe that it refers to the mining region in the Sinai named the "Country of Turquoise." The Iranian name for turquoise is *piruzeh*, and to the ancient Persians it was probably known as *smaragdus*. In modern China it is called *Sung-tse shi*, while the Tibetans refer to it as *gyu*. Mogul invaders called it *kiris*. It is called *biruza* in Russia and *Turkis* in German. The ancient Aztecs of Mexico listed it under *chalchihuitl*, a name applied to many green minerals. To the Indians of the Southwest it is known as *dotlizhi* and the Apaches referred to it as *duklij*.

Two spellings of the word—turquois and

turquoise—appear in the literature. At one time in America, mineralogists omitted the final "e." Today, however, the preferred spelling of turquoise is with the final "e" in accordance with international nomenclature usage.

In its raw form, turquoise is an unattractive opaque mineral. However, when touched by man, crafted and polished, it may acquire that heavenly quality of turquoise called "Zat." This term, as described by Joseph Pogue is . . . "A good stone, in short, must possess an undefinable property which is something like the water of a diamond or the luster of a pearl. A fine colored turquoise without the "Zat" is not worth much . . ." and thus, with "Zat," turquoise becomes "the gem of heavenly blue" of Omar Khayyam. It is the gemological properties that gives to turquoise the "Zat."

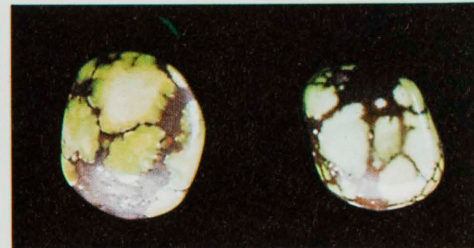
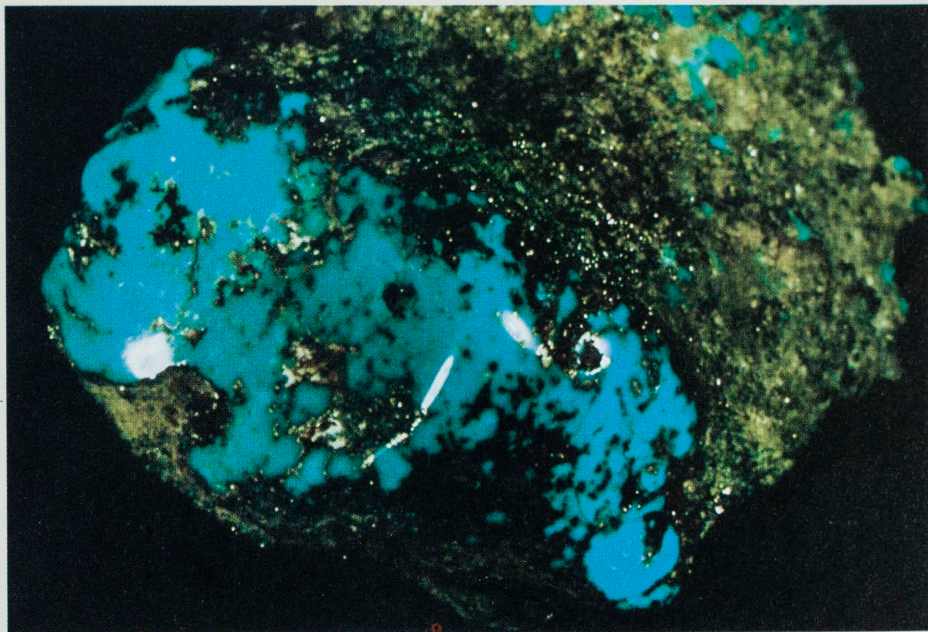
Chemically, turquoise is a copper-aluminum phosphate hydroxide hydrate of variable composition. The formula is usually given as $\text{CuAl}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 5\text{H}_2\text{O}$. Iron (Fe^{3+}) substitutes for aluminum (Al^{3+}) to form a complete isomorphous series with chalcociderite, $\text{Cu}(\text{Fe}, \text{Al})_6(\text{PO}_4)_4(\text{OH})_8 \cdot 4\text{H}_2\text{O}$, in which $\text{Fe}^{3+} > \text{Al}^{3+}$. Another series apparently exists between turquoise and faustite, $\text{Zn}(\text{Al})_8(\text{OH})_8(\text{PO}_4) \cdot 4\text{H}_2\text{O}$, in which the copper is replaced by zinc.

Turquoise is semitranslucent to opaque in its finest gem quality. The refractive indices are near 1.61 and 1.65; however, only one reading, usually near 1.61, is seen on the refractometer.

The hardness of turquoise varies from 5 to 6 on the Mohs scale. Its fracture varies from sub-conchoidal to irregular depending on whether the material is compact or chalky. Turquoise's specific gravity (density) varies from 2.60 to 2.90. The fine, compact Persian material ranges from 2.60 to 2.70, and much of the American material from 2.75 to 2.85. The luster on conchoidal fracture surfaces is waxy in the compact material and earthy in the more porous specimens. Turquoise crystallizes in the triclinic system.

Usually, turquoise is found as cryptocrystalline masses, and the only deposit of crystals reported occurs near Lynch Station, Campbell County, Virginia. There, clear blue triclinic crystals occur usually on a quartz matrix or on mica schist, a metamorphic rock.

Turquoise varies in color from a rich sky blue through pale blue to green to practically white. The blue color of some turquoise is probably due to the presence of copper, while the greenish hues are attributed to iron. The alteration or fading of



Sadie Green turquoise cabochons. Geronimo Trading Post Photos—Torrance, California

Turquoise nodule from the Tom McKee Collection. Jeff Kurtzman Photo



Persian turquoise matrix specimens (left Breccia, Middle—Nodule, Right—Seam) and cabochons below.



Variation in turquoise colors. Lower left—Bisbee Blue turquoise, Arizona. Middle—Turquoise with dark blue azurite and green malachite, Mexico. Lower right—Sadie Green turquoise, Nevada King Mine, Nevada. Geronimo Trading Post Photo, Torrance, California



Battle Mountain turquoise set. Neil Koppes Photo

some stones from blue to green over a period of time may be the result of dehydration. This drying out is probably due to the greater porosity of the poorer quality materials.

Turquoise is a secondary mineral usually found as thin seams and veins or irregular stringers traversing weathered, altered rock near the earth's surface. It can also occur as nodules and grains. Usually, it is formed by the alteration of rocks which are rich in aluminum containing phosphate minerals and disseminated copper minerals that occur chiefly in arid regions. It is no wonder that turquoise is associated with some of the world's major copper deposits. Since it is a product of weathering, it is rather porous, soft and usually associated with iron and manganese. Often, it is interlaced or webbed with narrow, dark brown veins of limonite, or iron oxide, and is then called "spiderweb." The term "turquoise matrix" is used when specimens contain other minerals and rocks of various colors.

The origin of turquoise deposits is of interest because, as a secondary mineral, it apparently formed by surface waters percolating through altered rocks containing apatite, a source of phosphate, and copper minerals. Sometimes the host rock is igneous, other times it is sedimentary, or even metamorphic. The ancient Egyptian turquoise mines at Wadi Magharah and Serebit El Khadem located on the Sinai Peninsula are in sedimentary rock. The turquoise occurs as seams and nodules on top of a purple sandstone below an iron-bearing sandstone. Turquoise from the Persian deposits near Nishapur is found as seams, veins and nodules in brecciated igneous rocks such as trachyte and diabase. These deposits are of interest because they are close to the ancient Oriental trade routes, and they may even be the famous "Mines of Isaac," as referred to in the Bible, which reportedly existed 2000 years B.C. The famous ancient Cerrillos Hills deposits of New Mexico are located about twenty miles southwest of Santa Fe in the heart of Indian country. The turquoise occurs in seams and nodules in an altered igneous rock called porphyry.

Remarkably, almost all the important turquoise deposits of the world are located in arid or desert regions. There they are generally found at shallow depths, rarely exceeding a few hundred feet. Small deposits have been found at greater depth, such as at Bisbee, Arizona, where turquoise occurs at the 1200-foot level in a mine.

Turquoise is not the easiest gem material to identify because there are many natural minerals similar to it and many materials

made to imitate it. Natural gemstones have always been in limited supply, and even the ancient Chinese and Egyptian civilizations tried to simulate precious gem material or to enhance it by various treatments, even to the present day. A large number of turquoise substitutes have appeared throughout history and some of the earliest deceptions are still around. Blue opaque glass and faience, a glazed siliceous material, are notable examples of extant imitations from ancient Egypt. Today, as in the past, glass imitation turquoises are still popular and used along with the newer plastic turquoise fakes.

A number of natural minerals resemble turquoise and some of these are discussed first. One of the more important substitutes is *variscite*, which, like turquoise, is a phosphate mineral. Variscite is found in many places of the world and is usually green in color. Some of the material is sufficiently similar in appearance to turquoise to make it a good substitute.

Lazulite is another phosphate mineral which may be similar to turquoise in the paler-colored varieties. Another mineral substitute is *chrysocolla*, which is often bluish-green in color. Other, relatively rare, blue minerals which can resemble turquoise are *shattuckite* and *papagoite*. One of the most fascinating simulants of turquoise is *odontolite* or "bone turquoise." This material is actually fossilized bone and teeth of extinct vertebrates, such as the mastodon, that have been impregnated with the blue mineral *vivianite*.

Recently, three new turquoise "look alike" minerals have appeared in the marketplace. They are *faustite*, *prosopite*, and *ceruleite*. These minerals look enough like turquoise to usually require gemological testing.

The popularity of turquoise has led to many attempts to produce imitations and synthetic turquoise. Numerous types of treatment are available to enhance poor-quality turquoise and improve the material to make it more useful in the arts. There are a number of imitations sold that have a composition similar to genuine turquoise. Sometimes low-grade turquoise (or other similar-looking minerals) is ground up and compressed under high pressure or "bonded" together with a plastic binder. The result is sold as "bonded turquoise." A dark matrix material can be added to obtain a "spider-web" or "matrix" effect. Another method of stabilizing the soft, pale chalky material is to impregnate it with colloidal silica. This technique not only hardens the material but also heightens the color, making it usable in jewelry. In the past, much of

the bonded turquoise was exported to Asian and European markets, where it was sold to tourists. This practice still prevails today.

Lower-grade turquoise is oftentimes "oiled" or soaked in warm paraffin wax to enhance it. This treatment tends to improve the surface color and polish. The "waxing" or "oiling" of turquoise apparently dates back to antiquity when ancient traders, such as Bedouins, may have enhanced poor-quality turquoise from Persia for resale to European buyers. The high porosity of low-grade turquoise also allows it to be easily dyed for color improvement.

Other turquoise imitations occasionally met in jewelry are blue-colored glazed *porcelain*, blue *enamel*, dyed blue *chalcedony* and blue-stained *bone*. Dyed *howlite* makes a very effective turquoise substitute.

Synthetic turquoise, now marketed by Pierre Gilson of Switzerland, has the same physical and chemical properties as the natural. It resembles the finest Persian turquoise in color. Yet another, and most recent, addition to the marketplace is "Turquite," a man-made mineral-based turquoise-like substitute.

The distinction of turquoise from natural minerals that simulate it and many imitations manufactured with similar properties is difficult. Consequently, no technical data is given in this article for detection because of this difficulty. The identification of doubtful specimens should be done by qualified personnel in professional gem-testing laboratories.

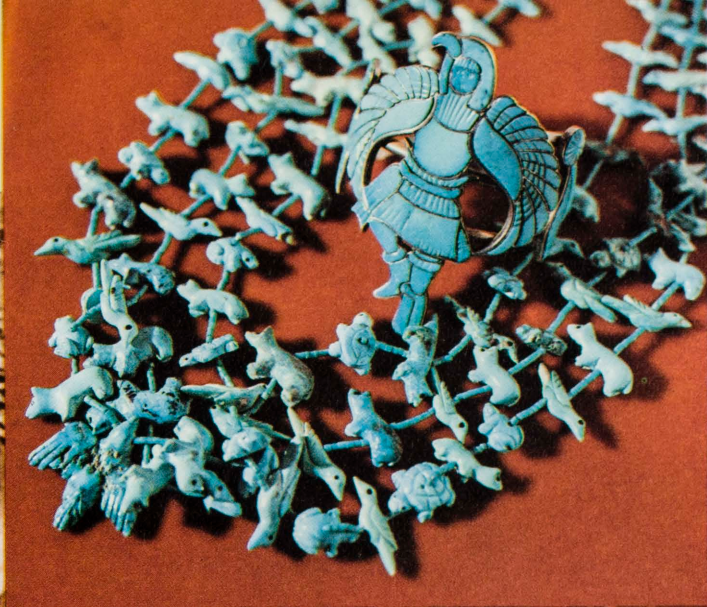
Turquoise is the stone of yesterday, today, and tomorrow which has and which will continue to thread its way through history. It has been an "in" gemstone and much desired for possibly 8000 years. Therefore, it has been "favored at many times" and continues to be in fashion. Turquoise is flattering to every skin tone, and since time immemorial this fact has been made use of by nearly all races.

Lost and forgotten in the U.S. for the last fifty years, it has suddenly returned to demand its place in the sun. Driven by inflation, a recent article in the *Wall Street Journal*, and the desire of the general public to invest in tangible assets, many people today are buying fine jewelry, which has, among other advantages, that of increasing in value through time. Today in America, turquoise is again in vogue—great demand, lessened supply due to worked-out sources, and spiraling inflation have greatly enhanced the value of high-quality turquoise.

Because turquoise can look beautiful by

David and Mary Tsikewa use high quality turquoise in their peerless carvings which make up the most appreciated fetish necklaces in the Hoel and Tanner collections.

Edward Beyuka's mark on Zuni inlays, such as the Eagle Dancer bracelet, right, stamps them with the hallmark of the master artist.
Ray Manley Studios





Top grade Persian turquoise with matrix pattern set in gold. Don Hoel collection. Ray Manley Photo

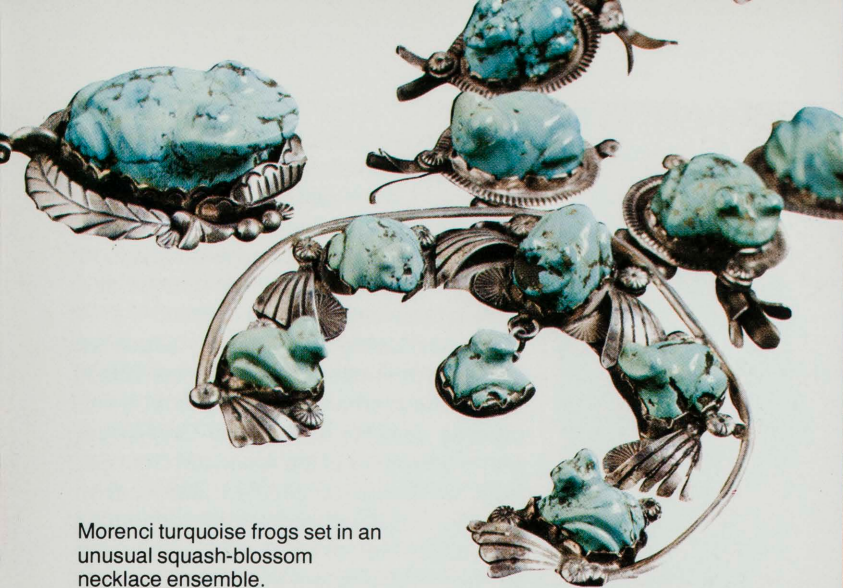
Rare Old Burnham turquoise in multiple squash blossom theme. Tanner's Arts and Crafts collection. Neil Koppes Photo



Half-size scale of superb Zuni needlepoint turquoise set in fine silver. Neil Koppes Photo

Tibetan turquoise earring set in gold. Marianne Shale Collection.





Morenci turquoise frogs set in an unusual squash-blossom necklace ensemble.



Bracelet and ring, top grade Number 8 turquoise, spider web.



Superb Lone Mountain turquoise set in an exquisite setting of fine detail silver.

One of the finest and largest collections of turquoise in the United States represents years of searching, and trading with artists, artisans and traders throughout the land. The pieces illustrated on this page are from the Don Hoel collection, Oak Creek Canyon, Arizona, which is acknowledged to be one of the most important sources of Indian jewelry and artifacts in the Southwest.

All Don Hoel photographs by Naurice Koonce and Ray Manley, Ray Manley Studios, Tucson, Arizona.

itself, the ancients used it without setting it. However, it can look beautiful set in either gold or silver. The blue colored turquoise needs no explanation or education to enjoy and appreciate. To some it can conjure up the sky, the summer, the marbles of Greece, or the South Seas. Turquoise is probably the only opaque stone which lets you "look" into it.

Much medium grade Persian turquoise, although hard and clear, is usually pale, light blue and can only be set effectively in yellow gold. In the Southwest, however, silver forms a different contrasting background which is more effective when used with the deeper-colored American turquoise.

Turquoise and Indian are synonymous in the minds of many people. However, Indian jewelry as we normally know it today is a relatively recent addition to the Southwest Indian jewelry craft. The working of silver and turquoise together was first introduced to the Navajos by Mexican artisans about 1890. Of course, the Indians had been working turquoise for centuries before in the form of beads, fetishes, inlays in shells, carvings, etc., but not mated with silver.

Four general types of Southwest Indian jewelry can be recognized:

Navajo

Generally, larger stones are mounted in massive silver settings by the Navajos, who are primarily silver-smiths. Navajos usually buy finished stones.

Zuni

Zunis are lapidaries who usually cut their own stones and create very detailed, more colorful and less massive pieces than the Navajo. *Needlepoint*, *petit-point*, *channel work* (inlay) and *fetishes* commonly of animal carvings are featured.

Santo Domingo

Bead work is characteristic. The Santo Domingans are the prime makers of *Hishi*, fine tubular beads made from turquoise, shell, tortoise, coral, jet, serpentine, etc.

Hopi

Hopi design is distinguished mostly by symmetrical silver overlay with very little turquoise used. Usually water symbols dominate the motif, e.g., clouds, rain, lightning, waves, etc.

Recently, the "white man" has invaded the Indian jewelry trade, and some turquoise and silver jewelry is now being made by someone other than Indians. Much of the craftsmanship is comparable to the quality of native work. The selling of this

type of counterfeit material without disclosure of origin is highly unethical.

Another questionable practice presently used in the Southwest is the backing of much of American turquoise with epoxy resin. Dealers justify this treatment by stating that it strengthens the stone and makes it more durable. Unfortunately, polished turquoise stones are sold by carat weight. One carat is equal to 0.200 grams. This practice results in jewelry makers and customers paying for the addition weight of the epoxy resin and getting less turquoise for their money. Ultimately, the final customer who purchases this type of Indian turquoise jewelry ends up paying the difference.

There was a time, especially in the American Southwest, when in buying turquoise one could be reasonably sure of getting natural material. But today, even the most inferior stones can be made beautiful and long-lasting by several methods of impregnating with plastic resins, or other chemicals, and coloring agents. If the seller informs the buyer that what he is buying is a treated stone, there is no harm. However, when the buyer is not told he is getting a treated stone or, worse yet, it is sold as natural, the unscrupulous dealer should be reported to local authorities or the Jewelers Vigilance Committee.

The question is often asked, "What is good turquoise jewelry?" Although what is "good" and "personal taste" are highly subjective, there are two common guidelines that can be used. The overall quality of a piece of jewelry, excluding its historical or other affinities, is generally determined by 1) the quality of the stone(s) and 2) the workmanship, which includes the design function and how well it is put together. It should be noted also that "what is good or is better is what you like."

Color is the most important single factor governing the value of turquoise. Blue is considered the most desirable color, the deeper and cleaner it is from inclusions, the better. However, some people prefer matrix with the turquoise. Much turquoise is a decidedly greenish-blue, grading almost into green.

Often, many people feel uncomfortable when buying turquoise because they know little about it. Some ways for the uninitiated buyer to feel more secure and to protect himself from deception when buying turquoise are:

- 1) Buy from an acknowledged, reputable dealer.
- 2) Educate yourself and learn about the stone; take courses in gemology.
- 3) Visit museums and auctions to study quality and to obtain comparative

prices.

- 4) Obtain a certificate of origin, stating the type of material, location, quality, description of piece, whether natural or treated, etc., and
- 5) If making a very expensive purchase, seek an expert's advice and get at least a second certified opinion.

If purchasing expensive turquoise jewelry in the United States, one can obtain an identification and appraisal from a Registered Jeweler or Certified Gemologist who is a member of the American Gem Society, or acquire a certified identification through a qualified gem-testing laboratory, such as the Gemological Institute of America, with headquarters in Los Angeles and offices in New York City.

Turquoise can be found in a wide range of prices, but this is not unusual because price is directly related to quality, supply, and demand. The problem for the potential buyer of turquoise is to determine, first of all, if it is turquoise and, if so, has it been treated or is it synthetic; then you determine the quality. Generally, the bluer the stone (which is less porous), the better the quality, and the greener the stone, the poorer the quality. Of course, some people prefer the greens just as the ancient Aztecs did, yet blue today is still the more popular color.

Remembering that the "*caveat emptor*" sales philosophy still prevails among some dealers and traders of turquoise jewelry throughout the world, the following bears repeating: Buy from reputable, established dealers who will issue a certificate of origin and identification. If you feel that the price is not right, compare your potential purchase with other dealers. Seek the advice of experts if at all possible.

Turquoise is a very porous and relatively soft gem material which should be given great care. Stay away from water, detergents, oils, cosmetics, perspiration and other liquids, because these substances can discolor any but the least porous, richest blue and produce a greenish cast. Ideally, turquoise should not touch the skin. Consequently, because turquoise is not very durable, treat it as a delicate stone as it won't take much abuse.

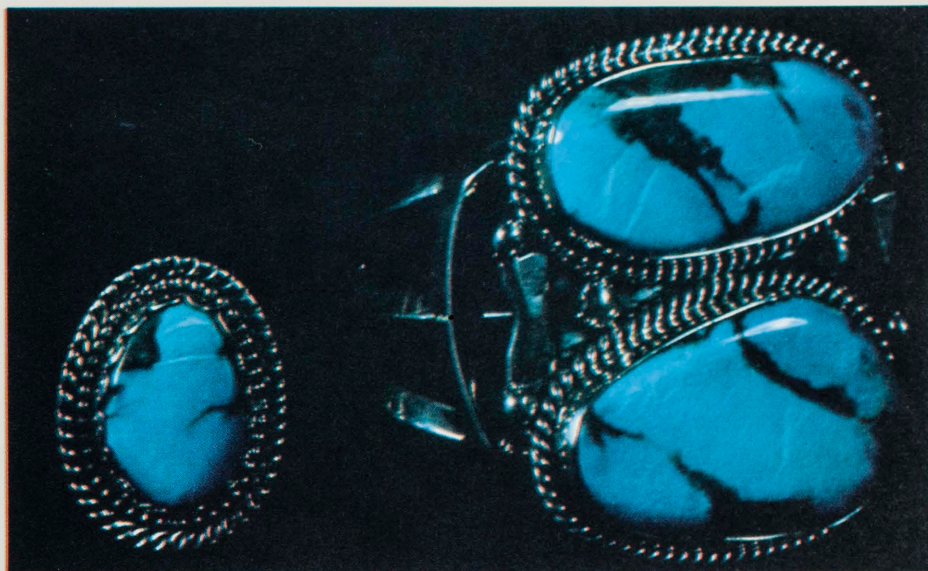
The following references will direct the interested reader to a more detailed discussion of turquoise:

The bible for the turquoise expert is *The Turquoise*, by Dr. Joseph E. Pogue. Originally published in 1915 by the National Academy of Science, it was reprinted by the Rio Grande Press, Inc., in 1972 with updated references, mine localities, and 16

new additional color plates.

Another colorful publication, surely to become a classic, is the *Arizona Highways*, January 1974 issue, Volume XLX, Number 1, along with the August 1974 issue. These issues contain a colorful journey throughout the wonderful world of turquoise and Indian jewelry of the Southwest. Unusual, exotic, and well-selected color plates depict examples which give the reader an esthetic pleasure as well as an education in turquoise and the Indian art form.

Dr. Robert Gaal began his distinguished career as a student in the Natural Science Workshop at the Natural History Museum of Los Angeles County. He was formerly Curator of Geology and Mineralogy at the Museum. Prior to accepting his current post of Research Scientist at the Gemological Institute of America, Dr. Gaal was a Member of the Technical Staff of TRW System for many years. His last article for this magazine was in 1966. We welcome him back.



Bisbee Blue with the quality known as "Zat", from the collection of Tom McKee and Associates, Scottsdale, Arizona. Neil Koppes Photo



Award winning sky-blue Lone Mountain necklace and bracelet set by renown Indian artisan, Yellowhand Geronimo Straight Arrow, great grandson of Geronimo. Geronimo Trading Post Collection, Torrance, California.

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Christmas Gifts at the Ethnic Arts Shop

1. Eskimo Carving from Canada—\$350.00—others \$40.00-\$500.00.

2. Roman Glass and Oil Lamp—1st to 3rd century A.D.—From \$10.00-\$150.00.

3. Box from U.S.S.R.—\$40.00—others from Poland, Syria, Italy, Kashmir, Nepal, Mexico, Hungary, China—from \$3.00-\$56.00.

4. Christmas Ornament from China—\$1.60—others from Thailand, Burma, India, Nepal, Portugal, Spain, Germany, Hungary, Poland, Denmark, Sweden, Philippines, Ecuador, Mexico, Peru—from 50¢ to \$3.50.

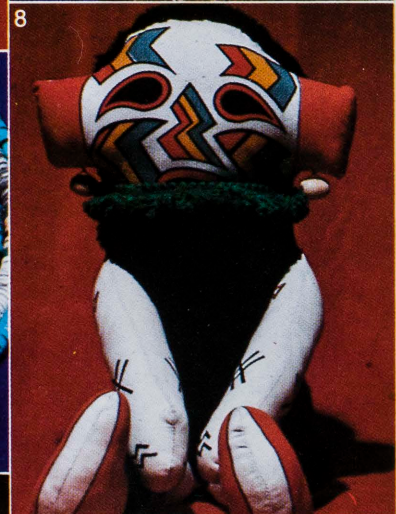
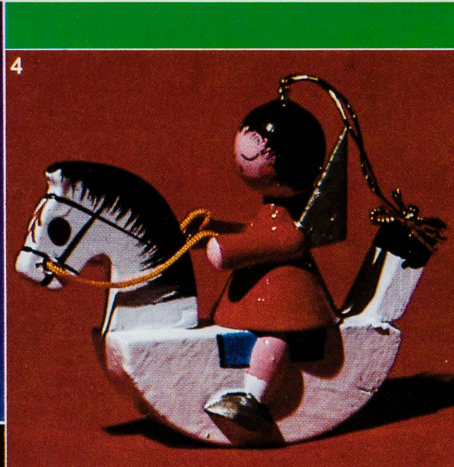
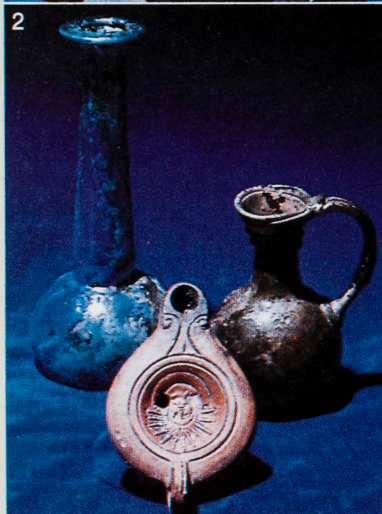
5. Heishe—American Indian, Santo Domingo—from \$30.00-\$175.00.

6. Pillow from Peru—\$20.00—others from Mexico, Ecuador, Panama, Guatemala, India—from \$10.00 to \$36.00.

7. Old Colonial Mask from Guatemala—\$52.00—others \$18.00 and up.

8. Stuffed Kachina Doll—\$16.75—other dolls and toys from Appalachia, Sweden, South America, Poland, U.S.S.R., Holland, China, Thailand, Guatemala—from \$1.00-\$30.00.

9. Ceramic Bull from Peru—\$17.00—other Ceramics and Pottery from Mexico, Brazil, Japan, Iran, and American Indian.



HOUSEWIFE ON A REEF

by Chaffee Castleton

Beneath my body, suspended midwater over coral sand, a school of lavender tang moves gracefully. Red and white spotted reef hind hide among the spikes of antler coral. A ghostly school of needlefish circles just beneath the surface.

I pull in my neck as six squid dart past my mask, their silent diaphonous Delta-wing shapes like the space ships that they are, only this time the "space" is the warm lively transparent water of the Caribbean off St. Croix in the American Virgins.

Ten days ago I was at home in Sherman Oaks, California. I am pony-build (which means overweight), in my sixties, a gray-haired housewife who happens inexplicably to have a "thing" about snorkeling over living coral in warm ocean water.

When household duties begin to pall, I am lucky enough to be able to go warm-ocean swimming in various parts of the globe: Hawaii, Tahiti, Fiji, Australia's Great Barrier Reef, the Indian Ocean off Mombasa, Bermuda, all through the Caribbean, off Mexico's west coast from Cabo San Lucas and Mazatlan to Acapulco and below, and in the east from Florida, Yucatan and Honduras to Costa Rica and across the Canal to Venezuela. And there has been warm-water but non-coral swimming in the Mediterranean, Adriatic and Ionian seas, where other joys await — to swim in the grottos, gather the shiny blue-black urchins, and dive for crabs.

I dive for shells, but my greatest delight is swimming in warm lively seawater over coral for the excitement of seeing what lies below.

I had spent two hours in a small chartered sloop tacking back and forth against the wind and tide to reach Buck Island from Christiansted. About noon I joined the



flotilla of anchored boats, and nestled into a buoy berth among assorted trimarans, catamarans, private yachts, and even the Buck Island ferry and motor-powered dories.

And now, in this water, I am rewarded. A hundred feet away, over a wall of living coral, is the powerful surge of the open sea, but the Trail is protected by this reef of strongly interlaced antler coral.

Visibility is excellent, sixty feet or more, tapering off into the blue haze of distance. Into this I peer. What will come at me out of that shimmering infinity of blue? A manta ray? The gray shadow of a shark? The aluminum torpedo of a five-foot barracuda? Or is that silver flash just a school of fast-moving jacks? One never knows, and this is the nature of the intrigue.

I look down. On the bottom a mere twelve feet below, among the maze of hard corals, gorgonians, sea fans, and sponges, lie the

soft cushiony *beche de mer* that resemble black croissants, inert on white sand. If the sloth is the most relaxed animal on land, surely the *beche de mer* is the most relaxed at sea.

Here, within and behind the coral wall, reef fishes of all shapes, sizes, colors, and patterns are safe from many of the predators of the open sea, and from human predators as well, for marine life in the park is protected.

Now I look up through the warm clear water and see myself surrounded by needlefish. These slender phantom-like fishes are well adapted to living at the water's surface. Their backs are blue or green like the sea surface, and their sides silvery white, the color of the sea when viewed from below. Their slim needle-like jaws cut the water with minimum friction as they shoot silently through like pale ghosts.

I turn and see a school of jewel-like French grunts, bearing horizontal and slanting rows of iridescent blue dots on a rich blue background. Another school of blue tang swims by. Bright yellow when young, they change color as they mature.

Now an incredible lavender and emerald Queen parrotfish swims serenely by. I follow until she pauses in her peregrinations and begins gnawing on a coral head. I can actually hear the strong dental plates grind the hard coral. Sometimes smaller fish dart in to grab pieces that fall as the coral is crushed.

Nearby, a minute polka-dotted black and white trunkfish whirls in, the action of his fins reminiscent of helicopter blades. Just under the skin is a hard boxlike skeleton that discourages many world-be predators. I watch as the fish shoots out small jets of water that stir the sandy bottom, uncover-

ing small animals that are quickly eaten.

A short distance away is the beginning of the Underwater Trail. About fifteen people are in the area, some swimming, some towed on rubber rafts while they peer through face plates at the reef below. A few who can't swim sit on the towed rafts and look through a water-glass over the side. The rafts are towed by swimming tour leaders, who pause occasionally to explain what some of the reef life is about.

I swim alone—content with the fishes for company. Just ahead I see a mammoth queen triggerfish, two feet long, a magnificent royal blue with a long filamentous dorsal fin that waves majestically from side to side as the fish swims. The waving fin is to me an irresistible invitation to follow, and by so doing, I enter the first of the grottos of the Underwater Reef Trail.

The first grotto is an open space about

twenty feet in diameter surrounded by a living wall of coral with upright bracts that terminate less than a foot under the wave-dashed surface. The coral is fragile and can easily be broken by hand with little effort, yet it successfully withstands the heavy sea surges.

Further along is an area with massive pillars of coral. One of these is a singular structure, an unevenly built limestone column that rises twelve feet from the sand to within five feet of the surface, topped by a smoothly rounded brain coral. It is a handy place to stop and rest before moving on.

The fish along the reef are accustomed to human visitors and seem supremely indifferent to swimmers. I spot some squirrelfishes amid some finger coral, their black eyes watching me intently as I watch them. In their midst is a small fish, scarlet red in

color, a solitary soldier fish.

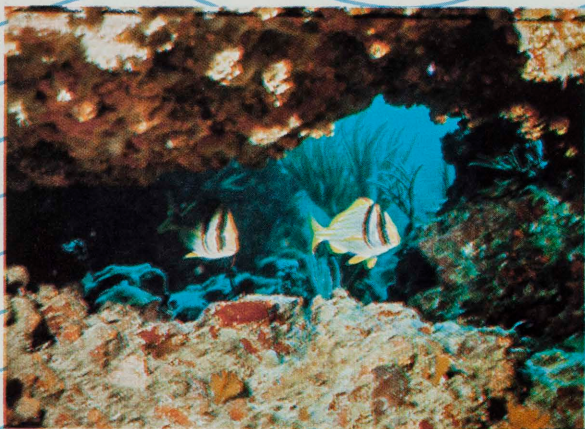
This isn't the only brilliant red on the reef. There are small cardinal fishes, and a stop-light parrot fish that lives up to its name, with its fire-red belly contrasting with darker red back scales outlined in black.

Behind some tube sponges lurks an olive-green and cream splotched Nassau grouper. A dignified fellow he, self-contained, apart physically and psychologically from the perpetual water ballet going on among the lesser fry all around him.

A five-foot barracuda glides into view, galvanizing the scene with drama. It is as if a movie had suddenly frozen into a "still." The ominous silver torpedo drifts broadside to me, fixing me with the fierce gaze from one black and silver tiger-eye. I can clearly see the needle-teeth of his undershot jaw, held slightly agape.

We both "freeze", the barracuda and I,

Porkfish
Bill Slosky Photo



Ribbonfish
Bill Slosky Photo



Schoolmaster Snappers
Bill Slosky Photo



French Grunts
Tom Sanders Photo



locked in some sort of timeless confrontation. Then, having satisfied his curiosity, this consummate fellow moves off as expertly as he appeared, without seeming to move a muscle.

I know barracuda are reportedly harmless to humans under most circumstances, but nonetheless, I breathe a sigh of relief. Everything returns to normal. The smaller fry resume their perpetual movement. The "still" has become a movie again.

And so in delight I swim from grotto to grotto, diving down twelve feet to the bottom occasionally to try to tweak the tail of a lizard fish lying motionless on the sand, or to brush the sand off one of the National Park Service's underwater signs. One reads, "This is fire coral. Don't touch." Another points out the resemblance of a convoluted coral to a brain, thus its title, "Brain coral."

I turn abruptly and swim through a break in the wall of coral into the open sea windward of the reef, and am suddenly transported into a new environment. It is as if a color movie switched suddenly to black-and-white. Color is drained. Everything is shadowy, mysterious, foreboding. The water here is deeper, at least forty feet, the sea floor sloping downward. Dead coral lies about, broken off by storms. There are no small colorful fishes apparent, no striking colors at all. The monotonous blue-gray and the emptiness seem ominous. I expect to see the primeval shape of a shark, perhaps the grotesque head of a hammerhead, to materialize at any moment out of the watery void.

I swim with slow, deliberate strokes, eyes alert. Nothing happens, no large predator appears, but shivering slightly, I am glad to swim back through the gap in the reef to the

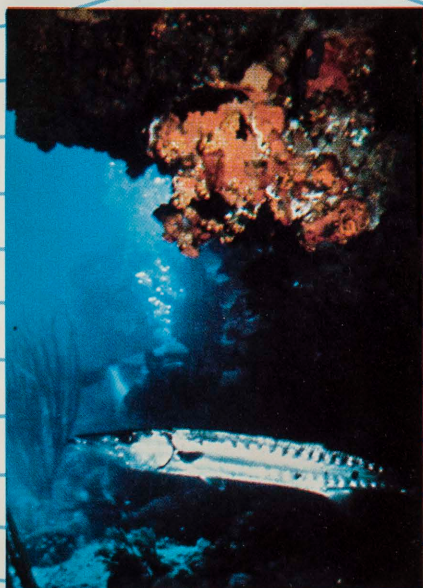
familiar grottos.

I stop to dive to a shadowed cave under a forest of antler coral. Here a pair of fairy basslets hover, glowing like Christmas lights in the semi-darkness. These tiny fishes, less than two inches long, are intense purple in front and bright yellow in back. They are a striking contrast to my vision of hammerhead sharks!

I glide on, out of the interlacing coral of the reef, past the trail-marked grottos, and back to the familiar place where boats are tied.

Along the way, I dive again, close to the bottom, and watch a jawfish dive tail first into his burrow. I pause to inspect the burrow ringed with pieces of coral and rock fragments that the jawfish gathered with his mouth to mark his home. These small fishes are fiercely territorial, and many intense battles go on among them, each

Barracuda
Bill Slosky Photo



Trumpetfish
Bill Slosky Photo



Grouper
Bill Slosky Photo



Queen Angelfish
Bill Slosky Photo



trying to protect his *lebensraum*.

Lacy gill worms jet back to their purple tubes in coral boulders as I pass. I feel as if I could swim forever like this. Surrounded by such beauty and life, suspended in gin-clear water, I feel indescribably joyous and free. It is as if I were suspended by sky hooks above a tropical forest, this marine jungle of brilliant colors and exotic forms over which I glide effortlessly. Each new view, each revelation, fills me with delight.

How can I return to a crowded smoggy man-made city, and be content? As a human, I must do human things, but I'll be forever haunted by shimmering watery images, iridescent flickering shapes, waving filamentous fins ever beckoning me into the infinite blue . . .

These will ever lure me back.

Chaffee Castleton is an intrepid snorkeler, skin diver, and shell collector. In the past twenty years she has explored underseas in the following areas:

- Off Mexico: Bocachibampo, Guymas, Todos Santos Bay, Ensenada, Puerto Vallarte, Mazatlan—Cedros Island, Manzanillo, Cuyutlan, Colima, San Blas, Acapulco, Zihuatenejo, Pierre Marques, Tehuantepec Penin. (Pacific and Atlantic)
- Yucatan: Isla Carmen, Isla Mujeres, Cozumel
- Off British Honduras: Belize, The Blue Hole, Glover's Reef
- Off Honduras: Roatan
- Caribbean: Virgins, Barbuda, Antigua, Marie Galante, Barbados, Tobago, Little Tobago,

- Trinidad, Aruba, Curacao, Bonaire
- Mid-Atlantic: Bermuda
- Indian Ocean: Mombasa, ports off Kenya and Tanzania, Malinde, Turtle Bay, Zanzibar
- Pacific: Hawaii, Fiji, Vave-U, Tonga, Tahiti, Australia, New Zealand, New Caledonia, Moorea, Huahine, Raiatea, BoraBora, Tahaa
- So. America: Venezuela, Colombia
- Florida: Keys, Sanibel, Captiva
- California: Catalina, Anacapa, Laguna, LaJolla, Tijuana River Slough
- Maine: Blue Hill Bay, Frenchman's Bay
- Mass.: Nantucket, Rockport, Cape Cod

Sea Slug
Green Island Photo

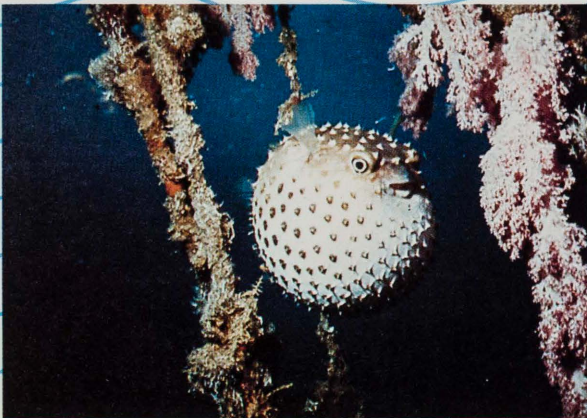
Butterfly Fish
Green Island Photo

Egg Ribbon of Sea Slug
Green Island Photo

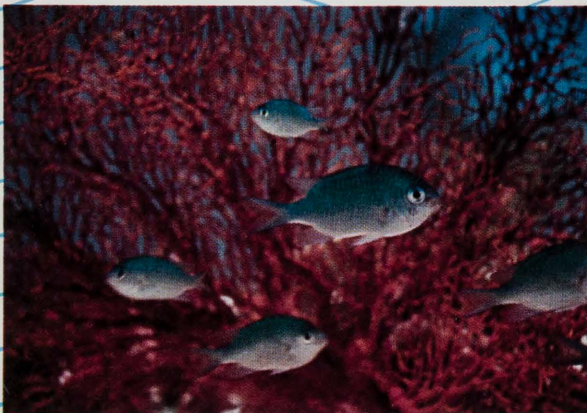
Butterfly Fish
Tom Sanders Photo

Coral Animals
Green Island Photo

Porcupinefish
Bill Slosky Photo



Damsel Fish
Green Island Photo

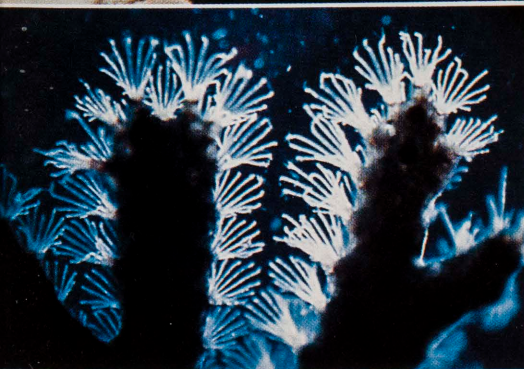
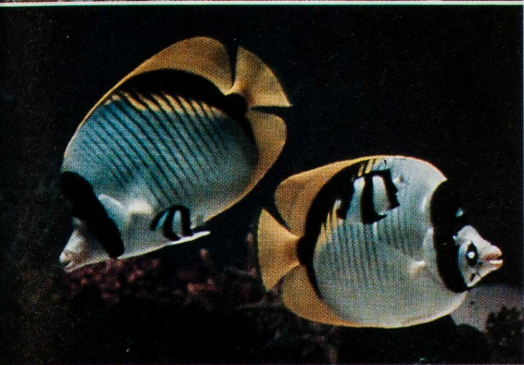


Painted Parrotfish
Bill Slosky Photo



Young French Angelfish
Bill Slosky Photo





continued from page 2

probably using somewhat improvised facilities, and that your authors doubtless receive more glory than money. For many of them each issue (like *Virtue*) is its own reward!

To all of you — thanks.

Cordially,

James S. Hartzell

Editor's Note:

Mr. Hartzell's appreciated letter touches on a little-known fact. *TERRA*'s staff of professional editors serve the publication without remuneration. Its authors, all of whom have published commercially, accept no fee for their *TERRA* articles. They have received gratification from the product, especially since *TERRA* won its two major graphics awards (one noted above) pitted against commercial magazines.

The arrival of Volume 13 No. 1, Summer 1974 of *TERRA* coincided with a visit to our Leonardo da Vinci Library of Peter Moore, supervisor of an Art and Design Library in a busy Polytechnic where students aim for degrees in fine art, design and industrial design, film making, photography, communications, graphic and print making. All students have history of art and liberal studies tuition such as film esthetics, oriental art and so on. He is one of the founder members of the Art Library's Society for which he is now a councilor, but the point of this letter is in his letter to me he stated "I have myself a special interest in visual aspects of popular culture; in particular the literature relating to *comic strip art* and animated films. On the other hand I am also involved in researching the historical development of Libraries in British Schools of Art & Design."

So, in spite of the fact that I very much wanted to keep it I was constrained to give him this issue of the wonderful Quarterly magazine of The Natural History Museum of Los Angeles County, Volume 13, No. 1, Summer 1974 and he was simply delighted to get it, largely because of its leading article by Elizabeth Wright with Murray Harris. It is a knockout, to say nothing of *The Precolumbian Animal Kingdom* by Hasso von Winning and *Jade Stone of Heaven* by Gretchen Sibley.

We gave him William A. EmBoden's article on the Botany of Leonardo da Vinci and he is delighted to have this additional article by William A. EmBoden in your Vol. 13 No. 1, but the point of this letter is that I simply cannot do without the Quarterly Magazine of the Natural History Museum

of Los Angeles County Vol. 13, No. 1, Summer 1974 and I implore you to send me another copy to replace this one given away and if you can spare them I should like four additional copies! Am I not the original pig?

Yours very sincerely and gratefully

Dr. Elmer Belt

Editor's Note:

We sent Dr. Belt a copy of *TERRA* to replace the one he generously gave away. Extra copies of *TERRA* are available both at the Natural History Museum Book Store or through the Museum Alliance office for \$1 per copy, as long as they last.

Letter to Murray A. Harris, owner of comic strip memorabilia, and co-author, with Elizabeth Wright of *TERRA* article about it.

Dear Murray —

Can't thank you enough for the *TERRA*: a thoroughly delightful and delectable job in every department. (Have just completed an Academy brochure and delayed writing a bit in order to get a copy off to you with this letter.) I felt that the selection of cuts for the article, with their reflection of your astute collection, was superb. It is, in fact, the best group of illustrations I've ever seen accompany a piece on the comic strip, their effect being enhanced, of course, by the lavish use of color.

The Kat kover was stunning, and it's wonderful to have it in color for the Academy files. (As you know, the bulk of the Kat Sunday pages before 1932 were published only in black and white, which gives one to think that a major reason for Herriman having hand-tinted so many of his Sunday originals as gifts wasn't to demonstrate how much more effective they could be in color.) I was particularly taken, too, by the inclusion in the interior art of typical out-outs from the Puck section of the 1930s, as well as by the heatable comic card by Oppen and the three sheet music covers: these elements have all been ignored even in full-length books on the comic strip, despite their colorful importance in the art form as a whole.

Editors Note:

(Letter from Bill Blackbeard, Curator, San Francisco Academy of Comic Art)

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